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ARCHAEOLOGY

Final Report No. 12

AN ARCHAEOLOGICAL SURVEY OF THE WINNIPEG RIVER

by

A.P. Buchner

DEPARTMENT OF CULTURAL AFFAIRS AND HISTORICAL RESOURCES

THE HONOURABLE EUGENE KOSTYRA, MINISTER

1982

IMPORTANT

13(1) No person shall excavate for historic or archaeological research or purposes or search for or excavate for artifacts, paleontological objects or skeletal remains without a valid subsisting permit to do so issued under the regulations.

Manitoba Historic Sites and Objects Act, S.M., 1966 - 67, c. 22, s. 1.

Manitoba Regulation 30/80

Being a Regulation Under The Historic Sites and Objects Act Respecting Permits for Conducting Archaeological or Paleontological Field Research in the Province of Manitoba

(Filed February 29, 1980)

1. Any person wishing to conduct or carry out archaeological or paleontological field research in Manitoba shall first obtain a permit for the purpose from the Historic Resources Branch, Department of Cultural Affairs and Historical Resources.

2. An application for a permit to conduct or carry out archaeological or paleontological field research shall be made on Form 1 attached hereto.

3. There shall be a separate permit for each site or area at which archaeological or paleontological field research is to be carried out.

4. Each permit is subject to the special terms and conditions attached thereto or prescribed thereon.

12 Every person who finds an artifact or a paleontological object or skeletal remains or any object which he suspects might be an artifact or a paleontological object or skeletal remains shall forthwith report the find to the minister in writing.

AN ARCHAEOLOGICAL SURVEY OF

THE WINNIPEG RIVER

A. P. Buchner
Historic Resources Branch
Department of Cultural Affairs and
Historical Resources

1982

ERRATUM

Page 8, second paragraph, line 9: "a real" should read "areal".

TABLE OF CONTENTS

Acknowledgements..... iv

Background to the Winnipeg River Archaeological Project..... 1

Introduction to the Area..... 3

Field Strategy..... 11

The 1981 Excavations..... 19

Sharkey's Point No. 1 (EaKx-3)..... 22
Otter Falls No. 7a (EaKw-25)..... 26
Sturgeon Falls (EaKv-2)..... 30
Otter Falls Rapids North (EaKw-27)..... 36
Sylvia Lake No. 3 (EaKx-23)..... 39

Results of the Survey..... 43

Component Correlation..... 49

Site Distribution..... 57

Appendix 1
Erosional Dynamics of Archaeological Sites Along the Winnipeg River..... 71

The Artifacts 93

Literature Cited.....204

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Our sincerest appreciation goes to the residents of Golden Acres on Dorothy Lake, and in particular Mr. and Mrs. A.J. Church and Mr. and Mrs. C. Gale, whose hospitality and consideration will not be soon forgotten.

Once in the field, more individuals came forward with collections of material from the research areas, and this increased our sample size to the point that the following study became possible. I would like to express my gratitude to Mr. D. Johnson of Lac du Bonnet, Mr. H. Zechel of Seven Sisters, Mr. T. Howe of Pinawa, Mr. and Mrs. C. Gale of Winnipeg, Mrs. S. Robbie of Beausejour, Mr. R. Tuokko of Winnipeg, and especially to Mr. Denis Thibault of Pinawa. Mr. Thibault has been monitoring the shorelines of the Winnipeg River for nearly ten years and kept accurate records of site locations. His enormous collection of artifacts is catalogued, and Denis made field notes for each of his trips. In 1980, he turned over to us his collection from Research

Area No. 1 near Great Falls, Manitoba. In 1981, when our efforts were concentrated in Research Area No. 2 in the Whiteshell Provincial Park, he donated the remainder of it. In light of his commitment and generosity, this report is dedicated to Denis Thibault.

For their roles in the initiation and sustaining of the project, thanks are extended to the Honourable Norma Price and the Honourable Eugene Kostyra, successive Ministers, Department of Cultural Affairs and Historical Resources. I wish to acknowledge Dr. J.H. Steinbring for his consistent support for the conduct of archaeology on the Winnipeg River. Thanks are also due to the Department of Anthropology, University of Winnipeg, for providing laboratory facilities for the project. As always, Leo Pettipas, Historic Resources Branch, provided encouragement and support throughout both the field and laboratory components of the research, and Mavis Cowan skillfully guided us through a labyrinth of paperwork.

A.P.B.

December 1981

BACKGROUND TO THE WINNIPEG RIVER ARCHAEOLOGICAL PROJECT

In 1979, Manitoba Hydro announced that the water levels in the forebays of the Great Falls and Seven Sisters Dams on the Winnipeg River would be lowered for a period of three years to allow maintenance and repairs to the installations. Dr. J.H. Steinbring of the Department of Anthropology, University of Winnipeg, had been actively engaged in archaeological research in this general area for nearly fifteen years and perceived this event as an unprecedented opportunity to investigate the extent of inundation of prehistoric archaeological sites along the Winnipeg River. Accordingly, he submitted his recommendations to the Manitoba Historic Resources Branch.

The major concern was the Sinnock Site (EcKx-4) near Great Falls, which had been partially exposed due to the drawdown and would be reflooded at the end of the three-year period. Preliminary investigations of the site pointed to the fact that Sinnock was a largely intact, single-component site occupied by Plano peoples with some cultural affiliation to the authors of the Caribou Lake Complex to the north and east.

Upon receipt of these recommendations calling for mitigative surveys and excavations, the Department of Cultural Affairs and Historical Resources secured funds from the Treasury Board of Cabinet, and the project was incorporated into the Winnipeg River Archaeological Project of the Historic Resources Branch. The objectives of the Project were threefold:

(1) to locate, identify and interpret all archaeological sites within the areas effected by the drawdowns (the banks of the Winnipeg River from Great Falls to McArthur Falls and from Seven Sisters Falls to Sturgeon Falls);

(2) to record these sites fully for inclusion into the files of the Manitoba Historic Resources Branch; and

(3) to conduct salvage excavations at those sites deemed to be significant and which stood in imminent danger of destruction by a return to normal operating levels in the forebays of the dams.

Due to the constraints of time, logistics and geography, it was determined that the first season would be spent surveying Research Area No. 1 and excavating the Sinnock Site which occurred within it. The 1981 season would be used to conduct surveys and test excavations in Research Area No. 2 to the south, and the third and final year would be left open to complete work arising out of the first two seasons. A report on the excavations of the Sinnock Site has been published as Final Report No. 10 in the Papers in Manitoba Archaeology series of the Historic Resources Branch (Buchner 1981a). The report of the survey of Research Area No. 1 conducted in 1980, and the survey and test excavations on Research Area No. 2 conducted in 1981, are included within the present volume.

In the autumn of 1981, Manitoba Hydro announced that it was immediately returning the forebays of the Great Falls and Seven Sisters Dams to normal operating levels as the repairs had been completed one year ahead of schedule. In retrospect, it would appear that the timing of the various components of the research took place in the most appropriate order possible. The immediate result of the rise in river levels will be the flooding of the previously exposed beaches, thus greatly reducing the efficacy of any subsequent surficial survey. As both areas have already been extensively and intensively surveyed, however, no appreciable loss of data is anticipated. The 1980 excavations at Sinnock concentrated on the low-lying and previously flooded beach portion of the site, as this area produced the highest concentration of artifacts and stood in the most imminent danger of erosion. While this part of the site will undoubtedly be flooded by the 1982 field season, it can be

confidently stated that it has already been adequately tested. The 1980 excavations also included a thorough testing of the upper, unflooded portion of the site, which similarly produced artifacts *in situ*. As this part of the site is clearly in need of additional testing, and as no sites of greater significance were located in the 1981 survey, the 1982 field season may be profitably employed in continued excavation of the Sinnock Site.

INTRODUCTION TO THE AREA

Research Areas Nos. 1 and 2 occupy the banks of two discrete sections of the Winnipeg River in southeastern Manitoba (Figs. 1 and 2). Both fall within the Lower English River Section of the Boreal Forest as described by Rowe (1972), although the more southerly of the Research Areas (No. 2) is characterized by a heightened density and diversity of deciduous elements reflecting its proximity to the mixed coniferous-hardwood forests of the Rainy River Section immediately to the south and east (Rowe 1972:30, 111). Research Area No. 2, in fact, contains a number of colonies of prickly pear cactus and wild grapes. The soils, climate, modern vegetational mosaic and palaeoenvironment of both research areas have been discussed in considerable detail elsewhere (Buchner 1979: 11-25; 1980a: 9-10; 1981a: 13-17).

From an archaeological standpoint, southeastern Manitoba has witnessed more archaeological research than any other portion of the province. While it may be argued that archaeological investigations of southern Manitoba date to the middle of the 19th century (Gunn 1868), surveys and excavations of immediate relevance to either of the current research areas did not commence until the involvement of members of the Manitoba Museum Association in the 1930s and 1940s. Foremost among these were Mr. W.H. Rand, Mr. and Mrs. P.H.

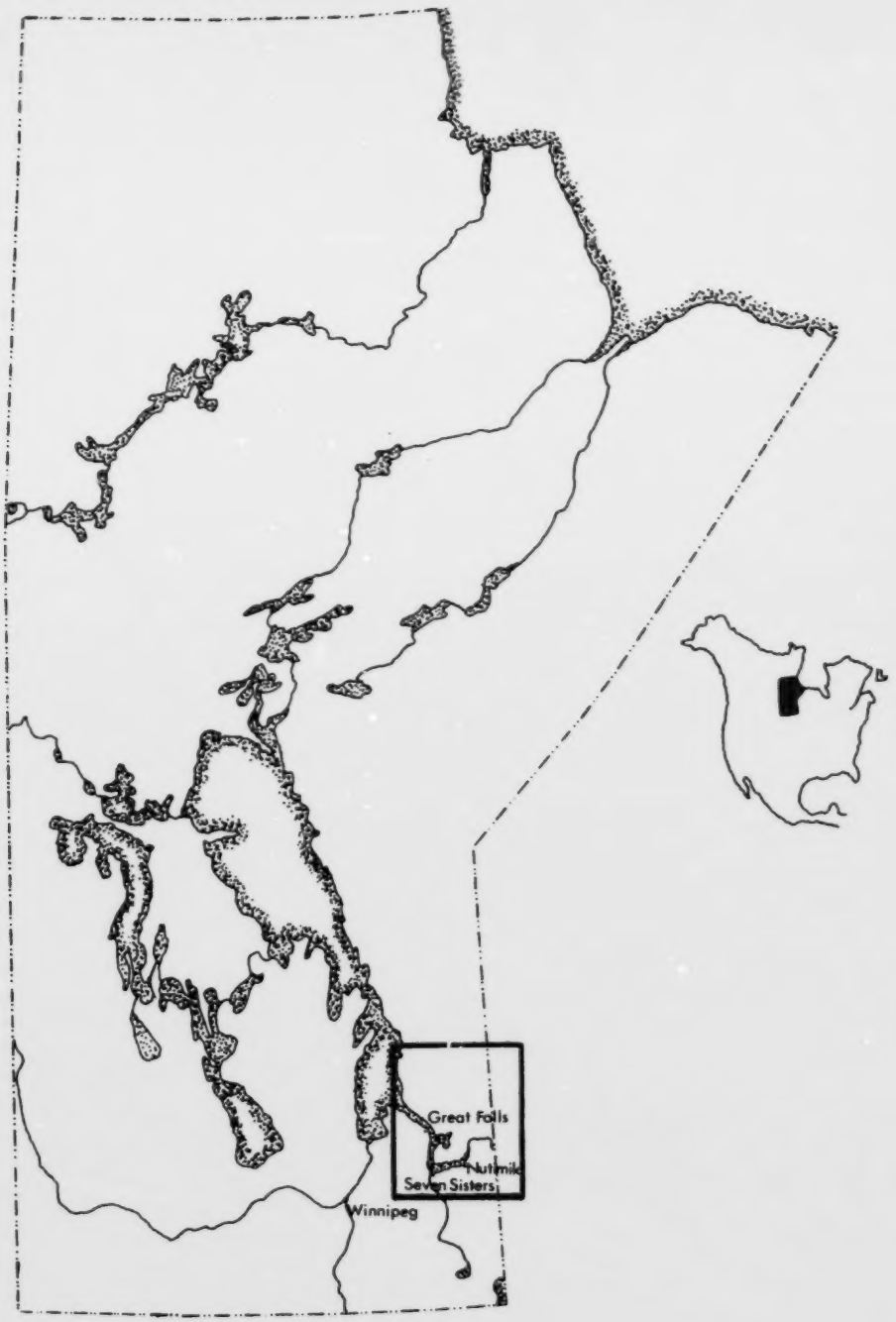


Fig. 1 Manitoba, showing general research area.

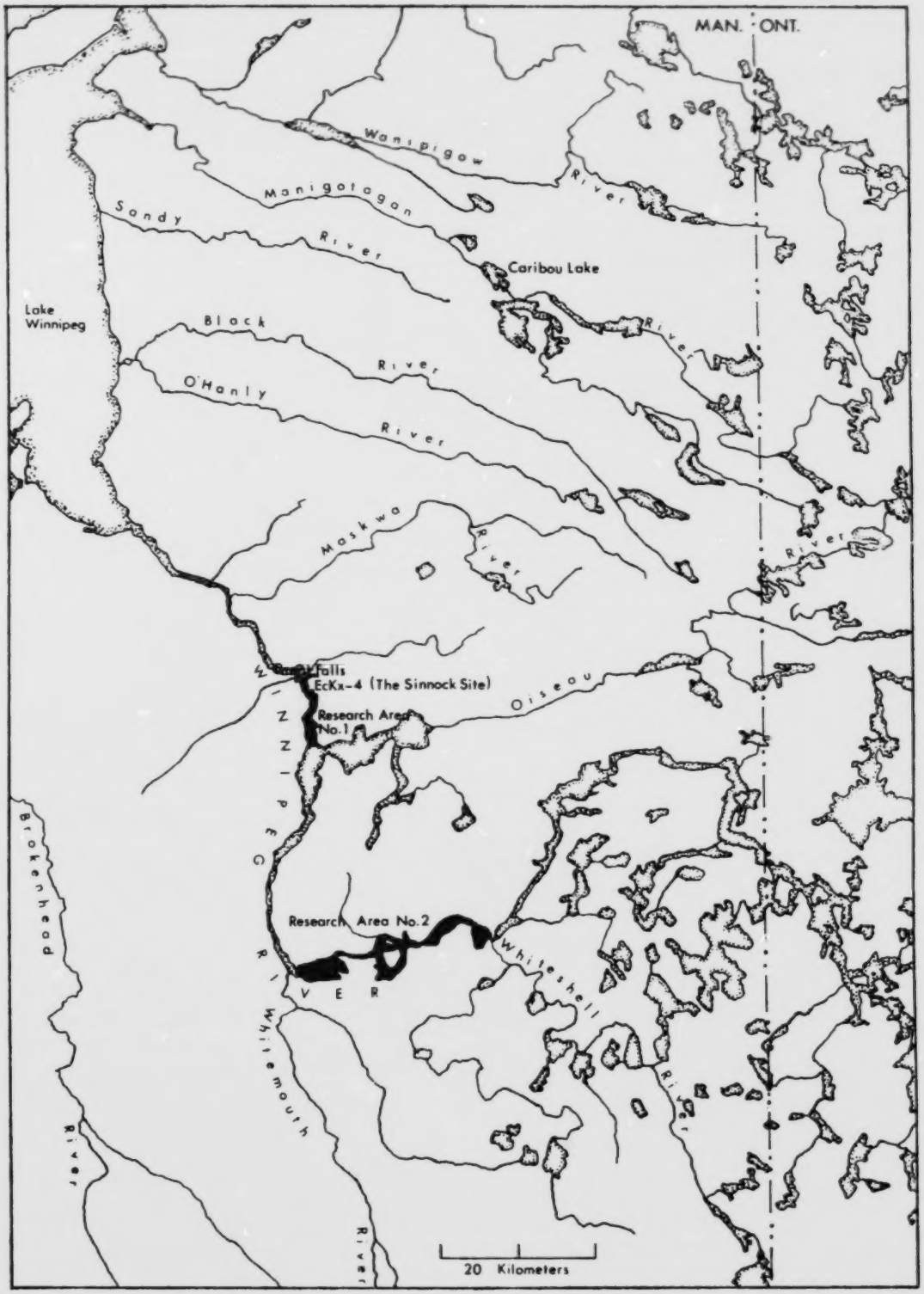


Fig. 2 Southeastern Manitoba showing Research Sections No. 1 and 2

Stokes, Mr. and Mrs. R.K. Helyar, Mr. P.W. Grant, Mr. W. Downes and Mr. E.A. Newcombe. In an unpublished, mimeographed report (Rand, et al n.d.), a survey of the Winnipeg River, including parts of the Whiteshell Provincial Park, is described, and specific mention is made of the Cemetery Point and Sturgeon Falls Sites (EaKv-1 and 2).

In the early 1950s, Dr. R.S. MacNeish surveyed much of southeastern Manitoba and excavated a number of sites on the Winnipeg River system: the aforementioned Cemetery Point and Sturgeon Falls, as well as the Anderson (EbKw-1), Tuokko (EbKw-2) and Waulkinen (EbKw-3) Sites in the Pinawa Channel. His final report (MacNeish 1958) was the first synthetic work on the archaeology of the region. Shortly thereafter, Boyd Wettlaufer conducted a survey of southern Manitoba, although only three sites were recorded in the vicinity of present interest, being situated on Lac du Bonnet between Research Areas Nos. 1 and 2.

Although Walter Hlady had been actively involved in southeastern Manitoba archaeology as early as 1949, his work is generally associated with that of the Manitoba Archaeological Society founded in 1961. The surveys and excavations of the Society allowed Hlady (1970) to publish an update and rethinking of the culture-history proposed by MacNeish.

From 1967 to 1978, virtually all of the fieldwork conducted in southeastern Manitoba has been accomplished by individuals affiliated in one way or another with the University of Winnipeg, with funding from the Provincial Government. Notable exceptions include Penny's (1970) survey of the upper Winnipeg River from Sturgeon Falls eastward, Trottier's 1970 and 1971 excavations at Falcon Lake in the Whiteshell (Trottier 1973), and McDonald's (1973) excavations at EcLb-1 on the northeast bank of the Winnipeg

River opposite the town of Pine Falls. The latter site may be of some significance, as McDonald was of the opinion that it may represent the location of Fort Maurepas. Penny's survey of a portion of the river contiguous with that of Research Area No. 2 would superficially appear to be of considerable relevance to the W.R.A.P., but this is not the case. Possibly the most interesting aspect of the work is the fact that so little material was collected from a section of the river immediately adjacent to the prolific Research Area No. 2. Considerations of sampling strategy and water levels aside, this would seem to be support for Hlady's (in Steinbring 1980: 312-313) suggestion that the Whiteshell River, and not the Winnipeg, was the preferred route for water travel from the Lake-of-the-Woods area as far west as Nutimik.

In 1967 and 1968, Elias, Alton and Steinbring commenced investigations of prehistoric boulder mosaics or "petroforms" (Steinbring 1970). Additional surveys were conducted during the early years of the following decade and in 1973 and 1974 the Astwood Site (Buchner 1980d) on George Lake was excavated as it seemed to lie in direct association with a pair of elliptical petroforms. The site was found to be a single component Laurel occupation and the typological date derived from the ceramics -- approximately A.D. 500 -- remains the most logical estimate of the age of such "geometrics" to date.

In the fall of 1971, Steinbring initiated excavations at the Whitemouth Falls Site near Seven Sisters. The site had been previously investigated by the Manitoba Archaeological Society and was deemed to be of some significance due to the occurrence of an Archaic copper artifact in a sub-surface context. Subsequent excavations, conducted by various individuals until 1976, revealed the presence of an enormous site spanning at least seven millenia. A

comprehensive report on the site has never been published. This is a problem associated with many large, complex sites as there seems to be a tendency for investigation by greater numbers of individuals, and for the curation of artifacts, notes and photographs to be shared by several different institutions. Considering the wealth of data recovered from the Whitemouth Falls Site since 1964, this situation is all the more unfortunate.

The period from 1973 to 1975 was characterized by considerable research of relevance to the Winnipeg River, even aside from the excavations at Whitemouth Falls and Astwood (It was during this time [1974] that the Manitoba Historic Resources Branch was formed. With the advent of that body, all provincially-funded archaeology was formally and officially subsumed under the program of the Branch). Three years of excavation of the Bjorklund Site, located directly across the Whitemouth River from the Whitemouth Falls Site, added considerably to our knowledge of the age, subsistence base and a real relationships of the Late Archaic and earlier Woodland populations in this part of the province (Buchner 1981b). S.G. Saylor (1976) conducted excavations at the multicomponent, albeit badly mixed, Maskwa River Site just north of St. George; Steinbring completed test excavations at the Porth Site only a few hundred metres west of Bjorklund; N. Williamson and R. Callaghan conducted a surficial reconnaissance of Traverse Bay; and Buchner completed testing of the Jansson and Margaret Lake sites. The latter is the only site to have been previously excavated in either of our current research areas with the exception of those investigated by MacNeish in the 1950s. Seven 5x5 foot squares were excavated to a maximum depth of 26 inches below surface. Despite the abundance of artifactual material on the

beach, very little was found in the units, and it was apparent that the site had been almost entirely destroyed due to fairly recent flooding. High water levels hampered all aspects of field work in this period and caused considerable site destruction along the entire length of the Winnipeg River in Manitoba. Excessive precipitation in 1973 and 1974 were largely responsible for the general lack of returns from the Traverse Bay survey (Williamson 1975), dramatic erosion at the Maskwa River Site, and continued destruction of the Jansson Site just north of Great Falls. Even as far upriver as Nutimik, massive sections of the Cemetery Point Site were observed collapsing into the lake. These conditions, however, did not preclude the possibility of conducting surveys, and between 1973 and 1975, a large number of new petroform sites were located and old ones accurately mapped (Buchner 1976a, 1976b; Steinbring 1976).

With the return to more "normal" water levels in 1976, surveys of the riverbanks and excavations of lowlying sites once again became feasible. In the fall of the year, Steinbring conducted a fairly extensive salvage campaign in the vicinity of the Fort Alexander Indian Reserve at the mouth of the Winnipeg River (Steinbring 1980: 138-162, 415-456). One of the central concerns of this operation was the rescue of human remains which were found eroding from the bank in a number of locations. The work was accomplished with the full co-operation and assistance of the Fort Alexander band and in particular Chief Phillip Fontaine. Thus it was that there had developed a considerable "backlog" of data which served as a stimulus for the publications of Buchner (1979) and Steinbring (1980) which may be jointly considered the third synthesis of the prehistory and early history of southeastern Manitoba in a 30-year period .

In 1977 and 1978, archaeological attention turned somewhat to the north to investigate a newly-discovered Plano complex on Caribou and Manigotagan Lakes (Wheeler 1978; Buchner 1979; Steinbring and Buchner 1980). In the Spring of 1979, the author became interested in re-evaluating some of the sites excavated by MacNeish nearly 30 years before, as many of these had become "datum points" for the interpretation of the archaeology of a broad area, extending well beyond the boundaries of southeastern Manitoba. This was facilitated by a re-excavation of the Cemetery Point Site (Buchner 1980a) by Wheeler in the 1979 field season, and a synthesis of materials collected from the Larter Site by Morgan and Carmichael in 1978 within the context of the University of Winnipeg Field School (Buchner 1980b). While the Cemetery Point Site excavations were ongoing, Mr. Norman Williamson was employed to survey selected portions of the Winnipeg River from Dorothy Lake to Numao Lake in order to assess the status of the sites which had been reported from this area over the previous 15 years. Additionally, he conducted archival research focusing upon evidence for the utilization of the Winnipeg River during the early Historic Period (in Buchner 1980a: 17-18; in Steinbring 1980: 336-381).

It seems clear that southeastern Manitoba has witnessed a degree of archaeological investigation which is not paralleled in many other areas of central Canada. Nonetheless, virtually all previous research has not been characterized by a systematic approach. In the past, the centre of attention has generally been the site, with "comparisons" inevitably being made in the literature to other sites. With the formation of the Winnipeg River Archaeologica Project in 1980, with a three-year mandate to conduct excavations as well as surveys, it became possible to investigate the Winnipeg River (or at least parts

thereof) in a more systematic fashion than had ever been previously feasible. It had become possible to investigate the totality of archaeological manifestations within two well-delineated geographical areas, each characterized by subtly different environmental characteristics in a way which would allow the area, or at least the "culture", to be the basic unit of analysis rather than the site. It may be anticipated that only by viewing a site in its context (in this case, the area) can its significance be assessed, and only by means of a "programatic" approach can the comparability of data sets be achieved.

FIELD STRATEGY

The field strategy for the survey of sites in Research Area No. 1 during the 1980 field season has already been described (Buchner 1981a: 5-12), but it may be useful to summarize it here briefly, as a similar design was utilized in the 1981 season.

Before the construction of the hydroelectric installations, the Winnipeg River consisted largely of a series of waterfalls and rapids descending in elevation towards the outlet of the river into Lake Winnipeg. Water levels, therefore, varied in a stepwise fashion rather than continuously as might be expected for a river whose course was not bedrock-controlled. Dams were constructed at many of these rapids and waterfalls such that the rise in levels behind the dams also occurred in a quantum fashion. In the immediate forebays of the dams, water levels rose dramatically and this was also generally associated in a pronounced widening of the river at these points and presumably all-but-total destruction of archaeological sites located there. Further upstream, the rise in elevation was minimal, and in some cases even negligible. Fortunately, detailed

topographic maps were made of the river before any construction commenced (Johnston 1915), and these could be compared with modern maps and the degree of flooding assessed (Fig. 3).

The operation of the Great Falls Dam had displaced the original riverbanks inland to a maximum of 500 m and no artifactual material was recovered from any of the banks in the immediate forebay. Only when surveys were conducted further upstream from the dam -- to areas which

Table 1. Identified Components and Sites in Research Area No. 1.

Borden Number	Other Designation	Controlled Collection	Controlled Excavation	Stone Tool Workshop	Stone Tool Workshop/Quarry	Stone Tool Quarry	Stone Tool Workshop/Kill	Stone Tool Workshop/Kill/Quarry	Stone Tool Workshop/Quarry/Kill	Stone Tool Workshop/Kill/Quarry/Village	Stone Tool Workshop/Village	Stone Tool Workshop/Village/Quarry	Stone Tool Workshop/Village/Kill	Stone Tool Workshop/Village/Kill/Quarry	Other	Illustration	Priority
EcLa-5	MacArthur Falls #3									X						Plates 8, 54a	D
EcLa-6	MF4																D
EcLa-7	MF5												X			9a-c	D
EcLa-8	MF7									X		X		X		9f-m, 54b	D
EcLa-9	MF8																D
EcKx-4	Sinnock		X	X												See Buckner (1981a)	A
EcKx-5	MF12								X	X						9n-q	D
EcKx-6	MF Island					X		X				X	X			9r-v, 10t-s	D
EcKx-7	MF Island #2		X							X						10t	D
EcKx-8	MF Island #3										X	X					D
EcKx-9	MF Island #4																D
EcKx-10	MF Island #5																D
EcKx-11	MF13	X									X	X				10u	D
EcKx-12	MF14									X						10v-aa	C
EcKx-13	MF15	X		X							X	X				11a-h	C
EcKx-14	MF17																C
EcKx-15	MF18																B
EcKx-16	MF19													X			D
EcKx-17	MF20	X															D
EcKx-18	MF21					X				X						11i-m	D
EcKx-19	MF22																D
EcKx-20	MF1							X			X	X	X			11n-y	D
EcKx-21	MF2													X			L
EcKx-22	MF6	X			X	X		X	X		X		X	X	X	12a-ff, 13a-w, 54c	C
EcKx-23	MF9																D
EcKx-24	MF10	X		X							X		X			13x-z, 14a-k	B
EcKx-25	MF23										X	X					D
EcKx-26	MF16															14l	D
EcKx-27																	D

Key to Site Priority

A. Site requires immediate excavation as it is of considerable theoretical importance and stands in imminent danger of destruction.

B. Some information could be gained through excavation of the site. Additional testing and/or surface collecting are warranted.

C. It is doubtful that (additional) excavation would yield any useful information. Continued surface collections may be adviseable.

D. Site represents only an isolated surface find or has been completely destroyed. It warrants no further attention.

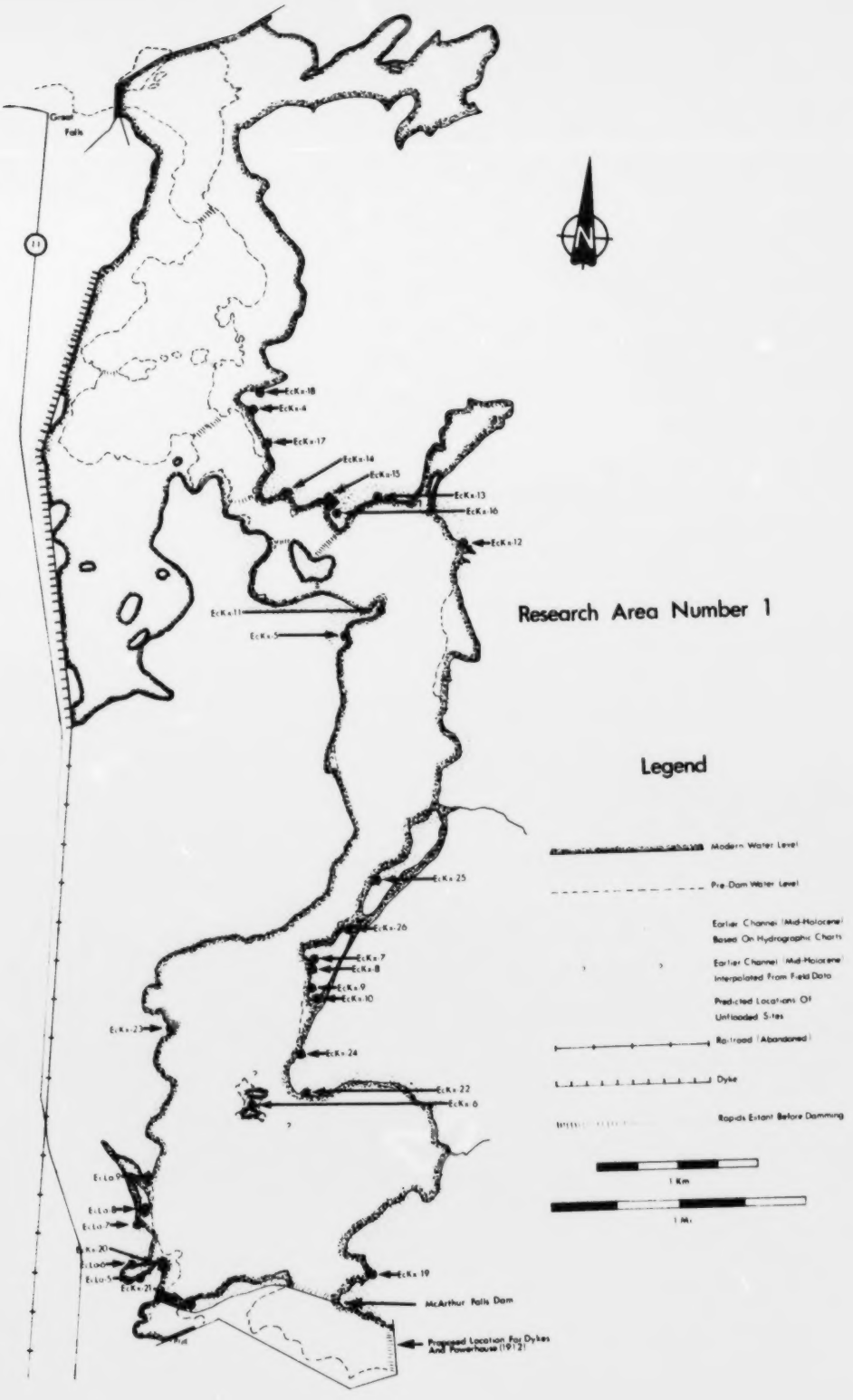


Fig. 3 Research Section No. 1 showing surveyed sites.

had been characterized by a shoreline displacement of 200 m or less -- were sites located. Thus, once the absence of surviving sites in the more heavily flood-damaged part of the section had been established, subsequent surveys were concentrated in those areas with a higher demonstrated probability of site survival. Nonetheless, all riverbanks were initially investigated, and most were surveyed many times.

Research Area No. 2 incorporates a section of the Winnipeg River which is approximately three times the length of that included in Research Area No. 1 (Fig. 4). The field seasons were of similar length and the crews of the same size, but as the focus of the 1981 season was almost exclusively upon survey, similarly reliable results accomplished by means of comparable research strategies could be attained. The first two weeks of the season were spent reinvestigating the sites located by Denis Thibault over the previous ten years in order to verify their locations, integrity and excavation potential. Early in the season, Mr. Thibault transferred the entirety of his collection from the Research Area to us for study and thus judgements of the significance of the various sites he had discovered were on a much firmer footing than had they been made on the basis of our own surface collections alone. After repeated surface reconnaissance, examination of collected materials, discussions with local collectors and initial testing, five sites were selected for more intensive excavations: Sharkey's Point No. 1 (EaKx-3), Otter Falls 7a or the Zechel Site (EaKw-25), the Sturgeon Falls Site (EaKv-2), Otter Falls Rapids North (EaKw-27) and Sylvia Lake No. 3 (EaKx-23). The results of these excavations are discussed in a later section.

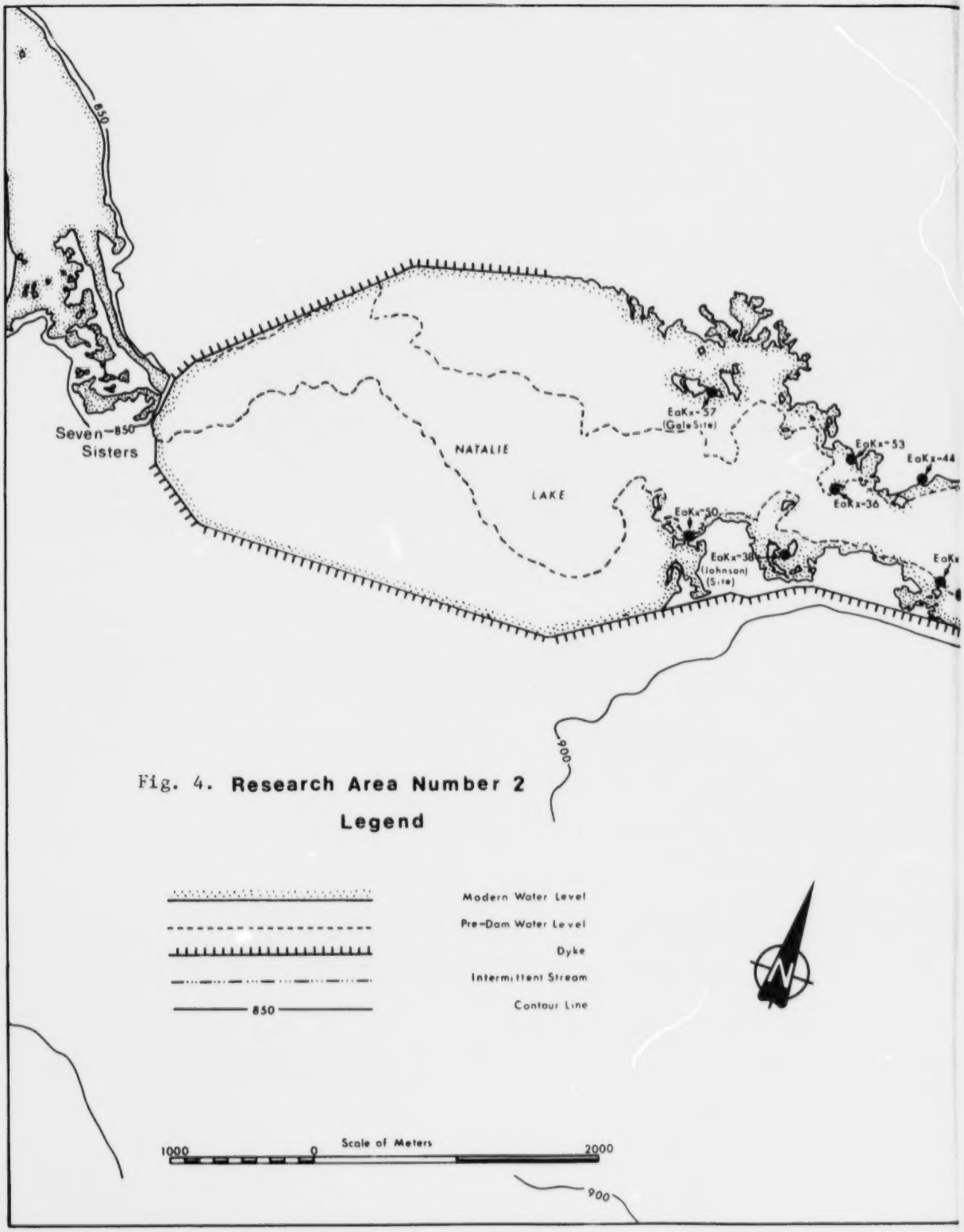
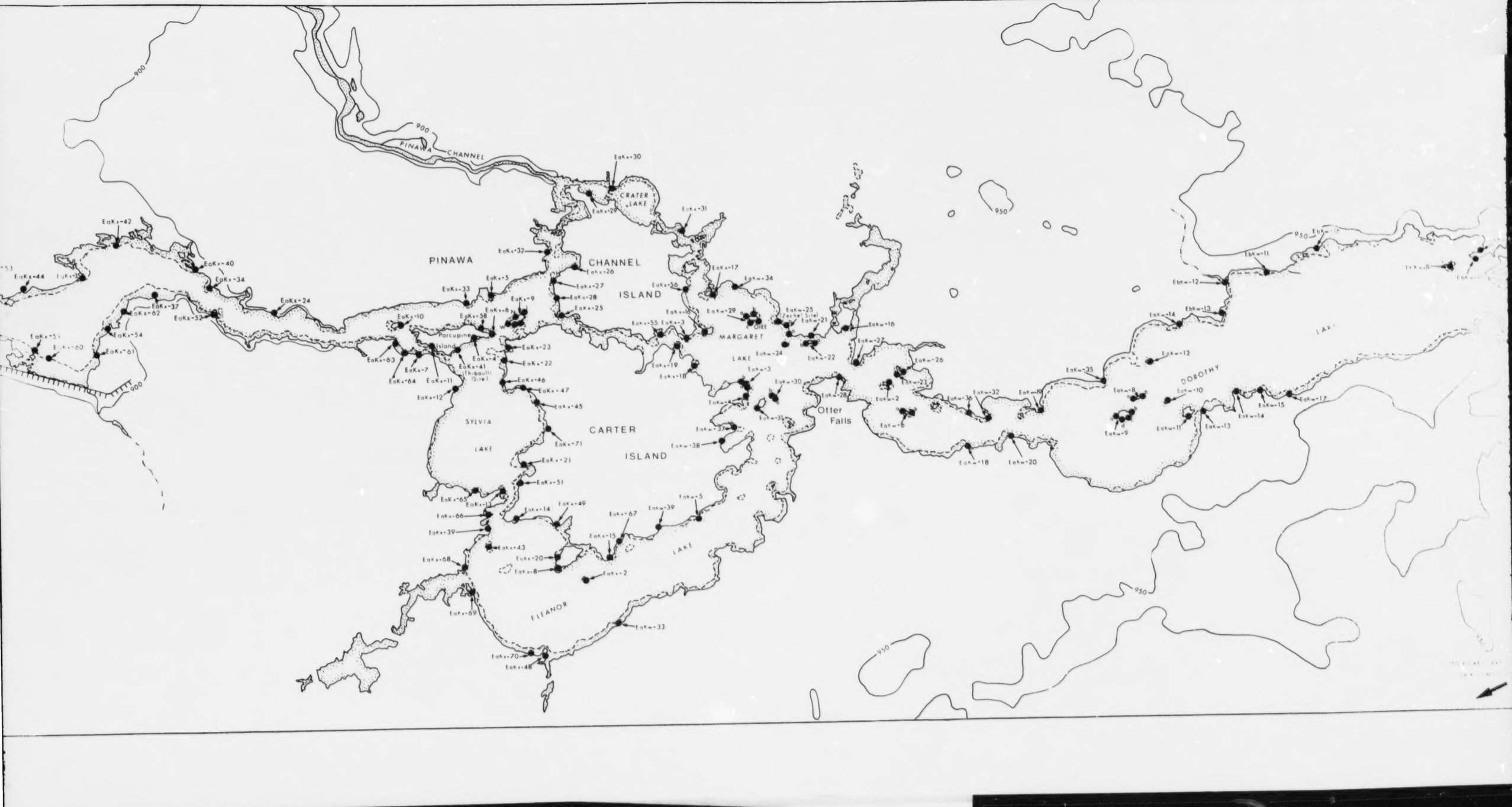


Fig. 4. **Research Area Number 2**

Legend


900
PINAWA CHANNEL
PINAWA
CHANNEL
ISLAND
CRATER LAKE
Porcupine Island
SYLVIA LAKE
CARTER ISLAND
ELEANOR LAKE
MARGARET LAKE
Otter Falls
DOROTHY
950
EaKx-30
EaKx-29
EaKx-31
EaKx-32
EaKx-26
EaKx-27
EaKx-28
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EaKx-58
EaKx-10
EaKx-4
EaKx-41 (Thibault Site)
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EaKx-19
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EaKx-29
EaKw-25 (Zeche Site)
EaKw-21
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EaKw-26
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EaKw-17

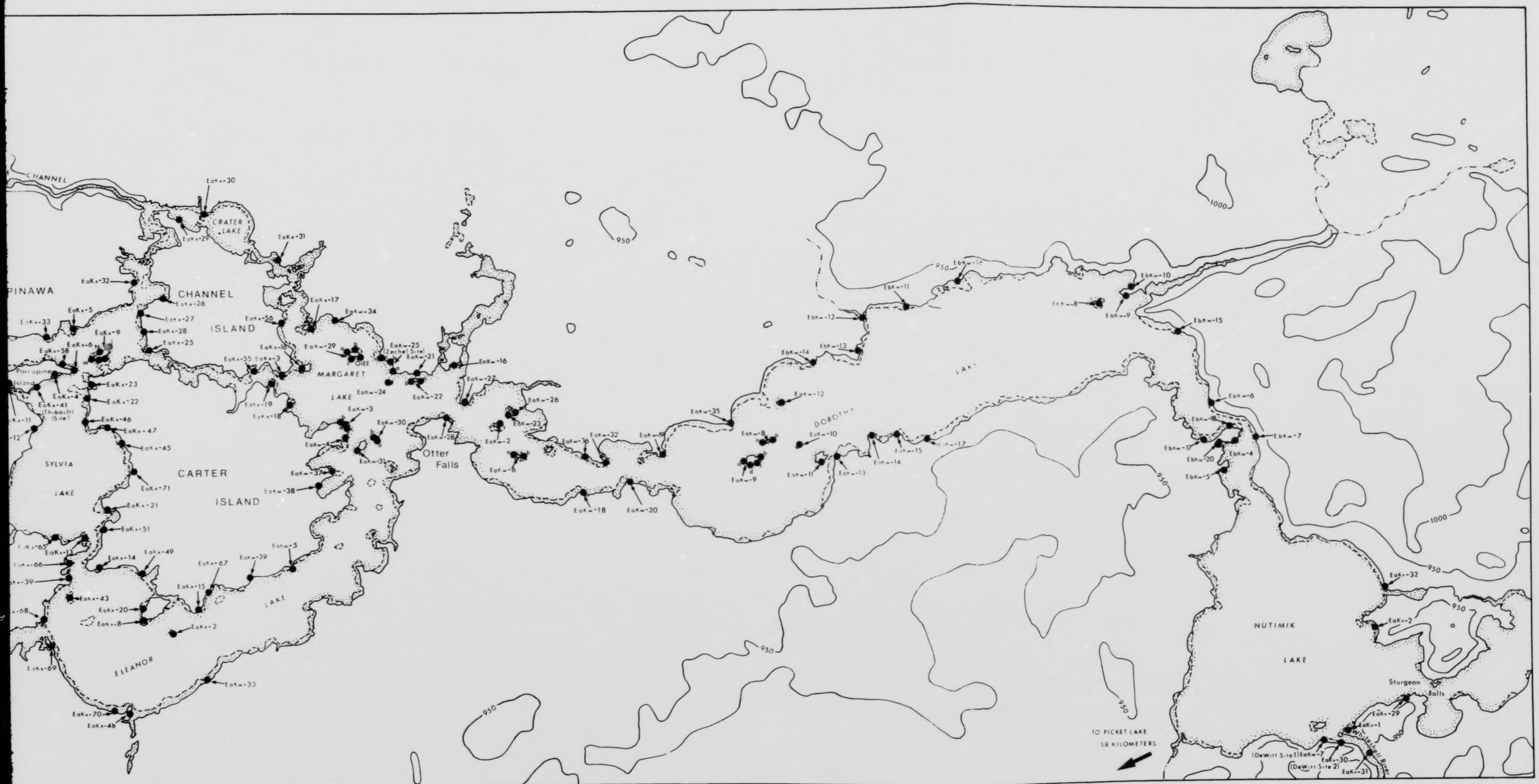

CHANNEL
CRATER LAKE
CHANNEL
ISLAND
MARGARET LAKE
Otter Falls
SYLVIA LAKE
CARTER ISLAND
ELEANOR LAKE
DOROTHY LAKE
NUTIMIK LAKE
Sturgeon Falls
950
1000
TO PICKET LAKE
3.8 KILOMETERS

Table 2. Identified Components and Sites in Research Area No. 2.

Borden Number	Other Designation	Tested	Controlled Excavation	Plano	Early Archaic	Radadtz	Old Copper	Oxbow	McKean	Cartier	Laurel	Blackduck	Selkirk	Historic	Other	Illustration	Priority
EaKv-1	Cemetery Point		X	X	X		X	X	X		X	X	X	X		14m-r	B
EaKv-2	Sturgeon Falls		X	X							X	X	X	X	X	15, 16a-cc	B
EaKv-29	Sturgeon Falls #2											X					D
EaKv-30	DeWitt #2	X						X	X					X		16dd-gg	C
EaKv-31	Whiteshell River	X				X	X			X	X	X	X			17, 18a-o	C
EaKv-32	B2											X				18p	D
EbKw-4	Opapiskaw #4				X							X				18q-w	D
EbKw-5	Opapiskaw #5																D
EbKw-6	Opapiskaw #6	X														18x	C
EbKw-7	Opapiskaw #7																D
EbKw-8	Barrier Bay #1										X		X			18y-bb	D
EbKw-9	Barrier Bay #2										X						D
EbKw-10	Barrier Bay #3	X									X	X					D
EbKw-11	Dorothy Lake #10	X										X					D
EbKw-12	Dorothy Lake #11	X										X					D
EbKw-13	Dorothy Lake #13	X										X					D
EbKw-14	S7																D
EbKw-15	S8																D
EbKw-16	B4											X					D
EbKw-17	Opapiskaw #1																D
EbKw-18	Opapiskaw #3	X															C
EbKw-20	Opapiskaw #2											X	X		X		D
EaKw-2	Otter Falls #1												X			19a-e	D
EaKw-3	Beaver a	X									X	X	X			19f-l	C
	b	X											X			"	D
	c												X			"	D
EaKw-4	Broken Point	X			X							X				19m-r, 20a,b	C
EaKw-5	Eleanor Lake #4	X											X	X		20c-s	C
EaKw-6	Otter Falls #2a	X											X			21a-p	D
	b	X														"	D
EaKw-7	DeWitt#1	X			X							X			X	21q-u	D
EaKw-8	Dorothy Lake #1a	X					X						X	X		21v-z, 22a-h	D
	b	X											X		X	22i-l	D
EaKw-9	Dorothy Lake #2a	X										X	X			22m,n	C
	b	X							X					X		22o-t	D
	c	X														22u	D
	d	X									X	X				22v-y, 55	D
EaKw-10	Dorothy Lake #3	X															D
EaKw-11	Dorothy Lake #4	X										X	X				D
EaKw-12	Dorothy Lake #5												X				D
EaKw-13	Dorothy Lake #6/9																D
EaKw-14	Dorothy Lake #7												X			23a-i	D
EaKw-15	Dorothy Lake #8												X	X	X	23j-z, 24a	D
EaKw-16	D4																D
EaKw-17	Pinewood Lodge Beach															24b-f	D
EaKw-18	Dorothy L.Narrows#1												X				D
EaKw-19	Dorothy L.Narrows#2	X											X			24g	D
EaKw-20	Golden Acres									X						24h	D
EaKw-21	Otter Falls #3									X			X	X		24i-k	C
EaKw-22	Otter Falls #4a													X		56a	D
	b														X	24l-n	D
EaKw-23	Otter Falls #5		X													24o	D
EaKw-24	Otter Falls #6													X		24p-s	D
EaKw-25	Otter Falls #7a			X						X	X	X	X	X	X	25, 26, 27a-r, 56b	B
	b	X								X	X	X	X		X	27s-bb, 28, 29, 30a-b	B
	c	X											X			30c	D
EaKw-26	Otter Falls #8															30d	D
EaKw-27	Otter Falls RapidsN.			X								X	X		X	30e-s	C
EaKw-28	OtterFallsRapids S.									X		X	X		X	30t-dd, 31, 32, 57	B
EaKw-29	Otter Island N.												X			33a, 58	D
	S.							X					X	X	X	33b-o	D
	W.	X										X	X		X	33p-v	C
	E.				X				X		X	X	X	X	X	33w-bb, 34, 35	B
EaKw-30	Margaret Lake #2a										X		X	X		36a-e	C
	b	X												X		36f	D
EaKw-31	Cactus Island		X														D
EaKw-32	Dorothy Lake #12		X										X			36g	D
EaKw-33	S4															36h	D
EaKw-34	Flynn													X		36i	C
EaKw-35	S6																D
EaKw-36	S5		X														D
EaKw-37	S1																D
EaKw-38	S2																D
EaKw-39	D1																D
EaKx-2	Penny Island		X			X						X		X		36j-x, 37a-d	C
EaKx-3	Sharkey's Point #1			X		X							X	X	X	37e-gg, 38a-e, 59a	C
EaKx-4	Vaughn's Site															38f,g	D
EaKx-5	Pinawa Marina												X	X		38h, 59b	D
EaKx-6	Porcupine Point		X														D
EaKx-7	Saskatoon Beach																D
EaKx-8	Eleanor Lake #2										X	X		X	X	38i-q, 39a-k, 60a	C
EaKx-9	Twin Falls Is. N.												X			391-o	D
	S.											X		X		39p	C
																39q-u, 40, 41	C

| | | |

EaKx-36	Forebay #3			X												51e-v	C
EaKx-37	Forebay #4											X				51w	D
EaKx-38	Johnson Site										X	X		X		52a-g	C
EaKx-39	Eleanor Lake #5	X															D
EaKx-40	Bear					X										52h	C
EaKx-41	Thibault Site	X														52i	C
EaKx-42	Spoon Site							X						X		52j-n	D
EaKx-43	Sunken Island																D
EaKx-44	C3																D
EaKx-45	Frying Pan Site																C
EaKx-46	Tucker Site	X															C
EaKx-47	Towrope Site	X															C
EaKx-48	Barrel Site											X					D
EaKx-49	E1																D
EaKx-50	Eba													X			C
EaKx-51	Pink Rock Point																C
EaKx-52	C2																D
EaKx-53	E5																D
EaKx-54	E4																D
EaKx-55	Sharkey's Dam													X			D
EaKx-56	D5																D
EaKx-57	Gale Site											X					D
EaKx-58	Loop Site	X														52o	C
EaKx-59	Willow Island	X							X	X		X	X			52p-dd	C
EaKx-60	Button Site			X							X			X		53a-j	C
EaKx-61	Dam Site															53k,l	C
EaKx-62	Gunflint Site													X		53m-r	C
EaKx-63	E2																D
EaKx-64	E3										X						D
EaKx-65	Snake Site	X														53s,t	D
EaKx-66	D3															53u,v	D
EaKx-67	S3																D
EaKx-68	SD3													X			D
EaKx-69	SD2															53w	D
EaKx-70	SD1							X								53x,y	D
EaKx-71	C1																D

With the addition of two crew members in mid-July, the survey component of the project was considerably intensified -- particularly in those areas which had yielded evidence of the fewest sites initially. Although the total number of site loci was increased to 149, the overall patterning and distribution of sites was similar to that evident from those which Thibault had mapped. The densest clustering of sites occurred around Carter and Channel (Hind) Islands where the westerly flow of the Winnipeg River is divided between the main course which continues to the west, and the Pinawa Channel which flows to the north (see Fig. 4). The westernmost end of Natalie Lake contained no sites whatsoever. This portion of riverbank lies in the immediate forebay of the Seven Sisters Dam and hence it would seem that flooding is a logical explanation for the absence of sites here, just as it had been for the forebay of the Great Falls Dam. Reference to the antedeluvial maps (Johnston 1915; see also Fig. 4) indicates that the original riverbank had been displaced as much as 1.5 km inland in some places and that the construction at Seven Sisters was entirely responsible for the creation of Natalie Lake. Additionally, however, an extensive system of dykes had been constructed along both the north and south shores and so it is possible that this also played a role in the inferred destruction of sites in this part of the research area.

Despite the obvious severe flooding in some parts of the research universe, all riverbanks and shorelines in the western part of the section were surveyed, and most were investigated several times. In the eastern half of Research Area No. 2, different problems were encountered. Some of the shorelines consisted of steeply sloping granitic cliffs. Although

it was clearly impossible that any excavatable sites could be present, these were surveyed nonetheless, as petroform and rock painting sites have previously been found in similar settings. Initially, it was feared that the abundance of private cottage lots on Dorothy and Nutimik Lakes and at Barrier Bay and Otter Falls would present an insurmountable obstacle to the complete sampling of the research area. A surprising number of local residents, however, were more than willing to allow us to survey their property, and in many cases, showed us around and gave us the artifacts they had collected at the water's edge. Without this kind of co-operation, the 100% sampling of the research area would have been impossible. After combining the material collected during the 1981 field season together with the donated artifacts, and the photographic records and notes of the materials in private collections, and considering the comprehensive survey strategy employed, there can be no question that the sample in hand is representative of both Research Areas Nos. 1 and 2.

At the beginning of the season, a total of 24 Borden designations had been processed for Research Area No. 2, and these were almost exclusively the result of the efforts of Denis Thibault. Previous investigations were restricted to excavation of the Margaret Lake Site in 1975 and Cemetery Point in 1979 and surveys of the DeWitt Sites, Cemetery Point, Sturgeon Falls and the Opapiskaw Sites at Barrier Bay (Fig. 4, Table 2). By the end of the season, 130 Borden designations had been used, and these sites were additionally divided into 149 discrete site loci. A total of seven sites had been excavated by controlled means and 49 sites had been test-excavated. Combining these figures with those for Research Area No. 1,

159 Borden numbers were used to describe 178 site loci. A total of 54 sites were intensively tested and nine had been investigated via controlled excavation. Soil samples were taken from all sites that were tested and from many that were not. It was hoped that the information that could be gleaned from them, when taken together with the results of the archaeological survey, would provide a more complete picture of the process of erosion due to hydrological factors since the original time of deposition. The findings of this study, undertaken by Michael Daly, are presented as Appendix 1.

THE 1981 EXCAVATIONS

Research Area No. 2 was found to be characterized by a considerable diversity of landforms in the preliminary survey. These ranged from sandy beach areas backed by high clayey-sand cliffs with mature vegetation on Nutimik Lake in the east (Plate 1), to extensive mud flats littered with decaying tree stumps and interspersed with pools of stagnant water on the shores of Natalie Lake in the west (Plate 2). This gradual deterioration of the river, reflective of the construction of the hydroelectric installation at the west end of Natalie Lake, was anticipated by the nature of hydro flooding as discussed above, and was also observed in Research Area No. 1. This kind of situation has obvious ramifications for archaeology. The only cases of sites with artifacts in situ occurred in the eastern half of the research area where flooding had been less extensive. The most westerly site which seemed to indicate some potential for excavation was EaKx-23, located near the northwestern shore of Carter Island (Fig. 4). Notwithstanding the above, even this site, as well as many others toward the middle

Plate 1. Nutimik Lake facing northeast.

Plate 2. The Button Site (EaKx-60) facing west.

of the research area had suffered extensive erosion due to flooding.

At a number of locations near the centre of Research Area No. 2 were located a series of survey pins imbedded into granitic cliffs which indicated the high water mark in 1947. Despite the fact that these were observed during a particularly dry year, in late August (the driest month), at a time when water levels had been artificially lowered at the Seven Sisters Dam, these markers were situated between 10 and 50 cm above the then-current water level. The modern high water mark as indicated by the elevation at which the growth of lichen terminated was 2 to 3 m above the 1947 elevation. From the outset, it seemed unlikely that an appreciable number of excavatable sites would be located, but it was toward this end that the earlier portion of the field season was directed.

Sharkey's Point No. 1 (EaKx-3) $50^{\circ}08'54"$ N x $95^{\circ}50'18"$ W

EaKx-3 is located on the southeastern shore of Channel Island at the upper end of the narrow channel between Channel and Carter Islands. This section of river, named Sharkey's Channel, is the shortest route downriver. Following the river around Channel Island to the north through Crater Lake is not only more time consuming due to the greater distance, but portions of this channel, particularly on the west side of the island are virtually unnavigable. Navigation to the south of Carter Island, through Eleanor and Sylvia Lakes is a fairly simple matter although it is approximately five times the distance through Sharkey's Channel. A small set of rapids occurs approximately 200 m downstream.

A surface reconnaissance of the rockface below the treed portion

Plate 3. Sharkey's Point No. 1 (EaKx-3) facing northeast.

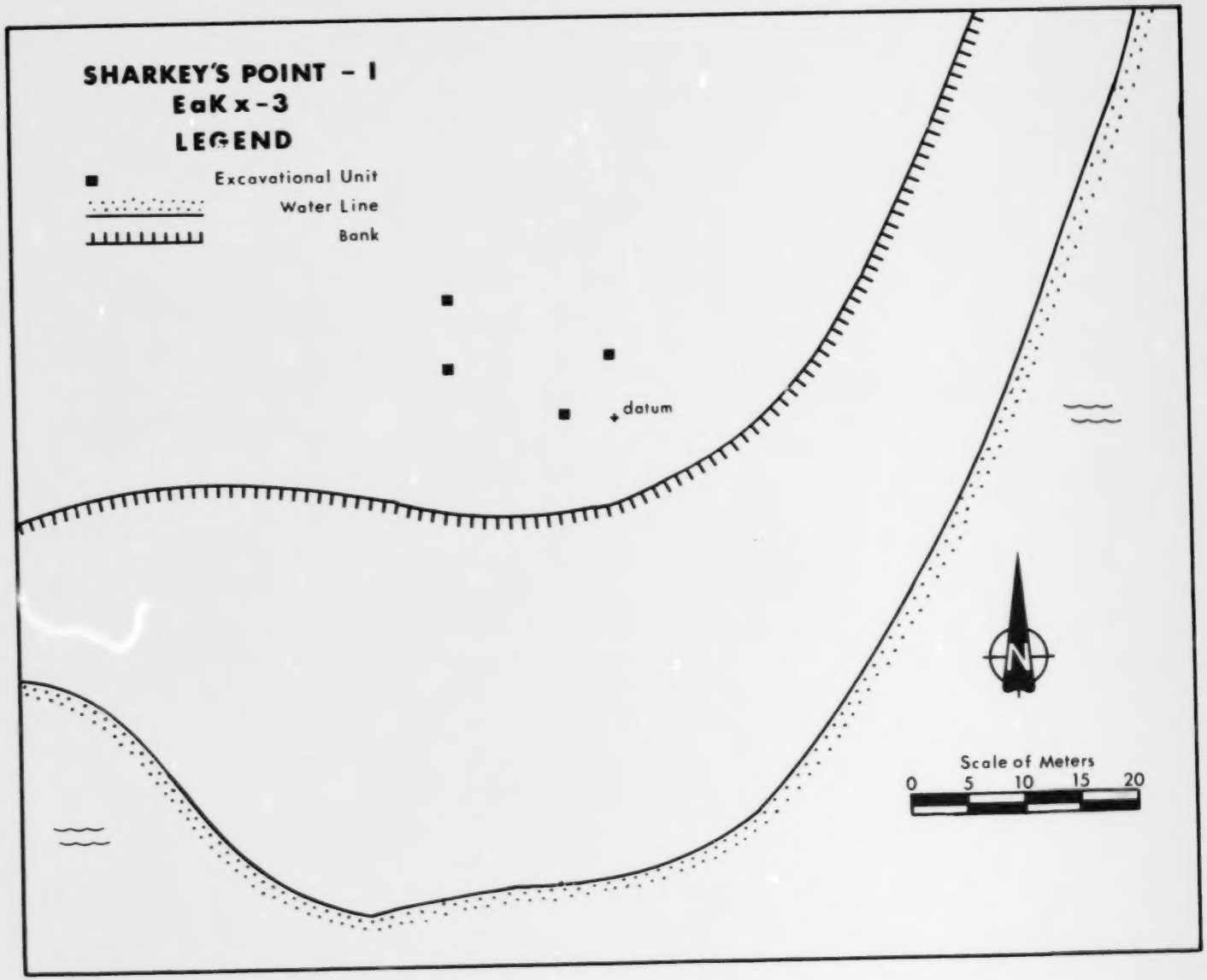


Fig. 5. Sharkey's Point No. 1 (EaKx-3).

of the site (Plate 3) revealed dense concentrations of minute flakes and a large biface of the type associated with materials of the Caribou Lake Complex on Caribou and Manigotagan Lakes (Steinbring and Buchner 1980). Evidence of the presence of this newly defined complex was the primary stimulus for the initiation of test excavations of the site (Fig. 5).

The "beach" portion of the site is characterized by a pioneering vegetational community dominated by lichen and marsh grasses. The higher ground behind the beach bears oaks and poplars with a dense second storey cover. Since the treed part of the site slopes down to the water's edge at a fairly steep angle (approximately 20^{o}), it was initially believed that it had sustained less flood damage than more level sites in the general vicinity. The soils of EaKx-3 are attributable to the Indian Bay Complex (Smith and Ehrlich 1967) with an LFH horizon 10 cm in thickness lying on the surface above a thin Ah zone. No Ae layer was discernible. The soil grades directly into the B horizon. Four $1m^2$ units were excavated to a depth of 30 cm above the bank (Fig. 5) but were found to be completely sterile. It would appear that this was a very small site which has been completely destroyed due to water erosion. The construction of the Seven Sisters Dam may not be the sole reason for this destruction, however, as another small dam was constructed only 200 m downstream from the site, presumably to maintain higher water levels near the rapids, thereby facilitating navigation. The date of construction of this feature is not known, although it appears on Johnston's (1915) maps. Artifacts from the surface collections are presented as Plates 37e-gg, 38-e and 60a).

Otter Falls No. 7a (The Zechel Site; EaKw-25) 50°09'09" N x 95°49'20" W

EaKw-25 is situated on the north bank of the Winnipeg River between the source of the Pinawa Channel via Crater Lake and the mouth of a broad intermittent creek designated the "English River" on some unofficial charts. Although the site has been subdivided into three discrete loci (a, b and c), most of the crew's efforts were focused upon locus "a" -- the most southerly section of the site. Surface surveys of the site in the early part of the season revealed an abundance of pottery, primarily attributable to the Late Woodland Period. Examination of collections made by Denis Thibault over the previous 10 years indicated the presence of Archaic components as well. Of particular interest was a ½-grooved polished gouge which was to the author's knowledge unique in southeastern Manitoba. Later in the field season, an additional two specimens were noted in the Zechel collection from other sites in the research area, although these were considerably smaller.

The beach area is composed of sand and bedrock 4 to 5 m wide which slopes upward gradually to a clay bank, 2 m in height upon which the excavations were concentrated (Fig. 6). The site is under an oak cover with some meadow grass near the south end, but secondary cover increases in density to the north (Plate 4). The soils may be subsumed within the Indian Bay Complex (Smith and Ehrlich 1967), but deposition is shallow. Profiles are characterized by a substantial LFH zone (5 to 8 cm thick) overlying a very thick Ah layer which may extend to a depth of 40 cm. Due to the shallowness of the soil over a bedrock base, there is no B horizon; the Ah directly overlies a gleyed C horizon. The thick Ah horizon,

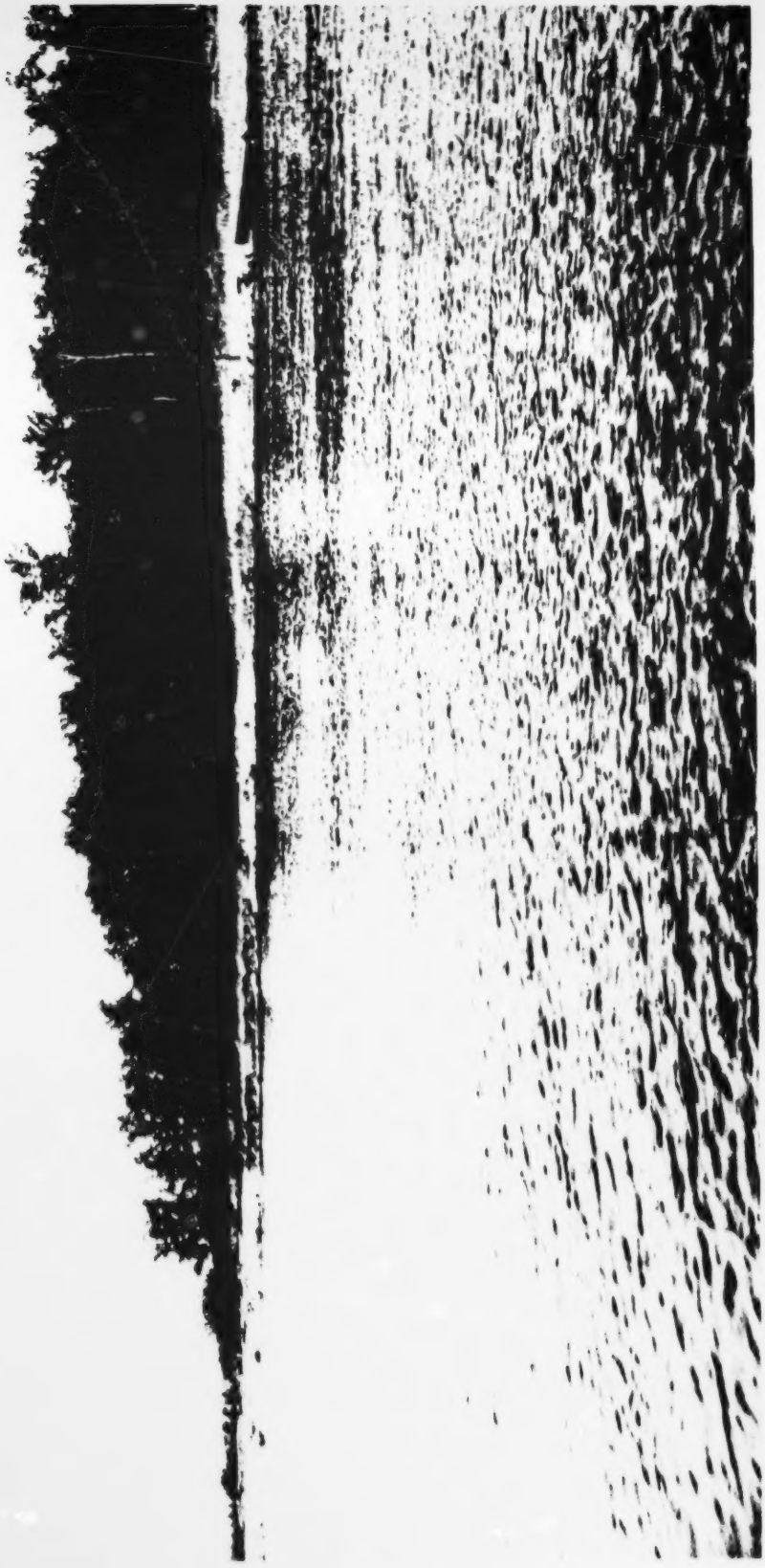


Plate 4. Otter Falls No. 7a (EaKw-25) facing north.

together with the relatively high elevation of the site, indicate that little flooding has occurred at that portion of the site which currently stands under vegetational cover. A raised lichen line on the oaks approximately 0.5 m above the forest floor may, however, indicate past, infrequent flooding. Drainage at the site is quite good, but the loose nature of the deposits renders them very susceptible to erosion at sustained high water levels.

A total of 13 $0.5m^2$ units were excavated to a depth of 50 cm along the southeast-facing bank. All but the easternmost of these units produced artifactual materials with the densest concentrations of artifacts occurring in the southwestern units near the point (Fig. 6). Recoveries from the excavations included corded ceramics, lithic debitage and a badly corroded iron object which may be a buckle. The iron object and a considerable quantity of Blackduck pottery occurred at precisely the same depth in the same unit, and there were no apparent signs of disturbance. Blackduck is generally conceded to be a prehistoric cultural manifestation although a radiocarbon date of A.D. 1870 $\pm$ 40 (DIC-1723) was received on bone associated with Blackduck ceramics at the Cemetery Point Site (EaKv-1) located 8 km upriver from EaKw-25. When this date is adjusted for the secular variation in atmospheric C14 by means of the dendrochronological calibration curves available (Ralph, Michael and Han 1974), an approximation of the true age of this sample on the order of A.D. 1772 $\pm$ 50 is achieved. White contact in this area dates to (at least) 1733 when Jean-Baptiste La Verendrye began his journey down the Winnipeg River to Lake Winnipeg to establish a post (Champagne 1969). Any traveller from Lake of the Woods

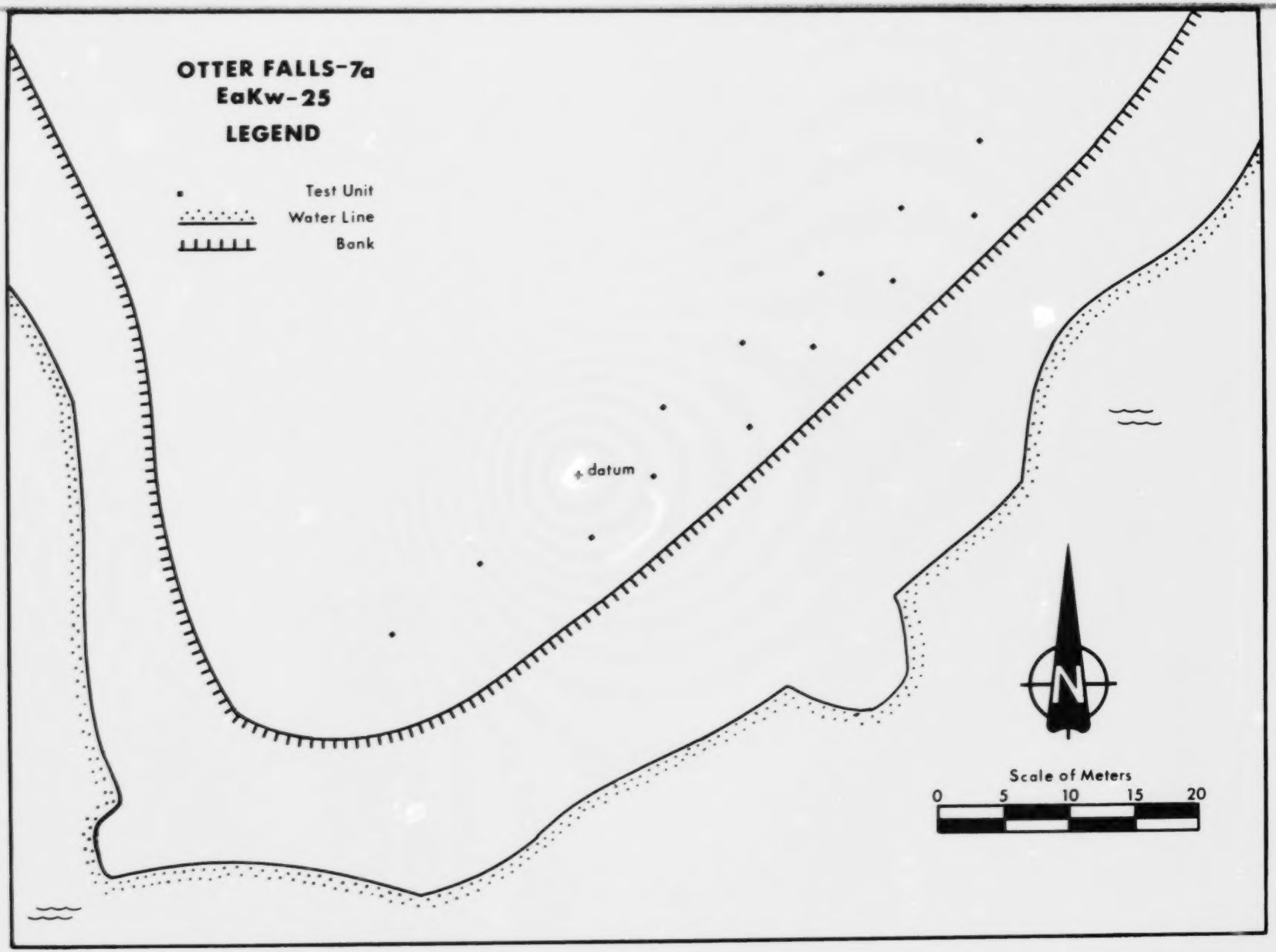


Fig. 6. Otter Falls No. 7a (EaKw-25).

to Lake Winnipeg must of necessity have passed within a few hundred meters of the site as it is situated between the mouth of the Pinawa Channel and the main course of the Winnipeg River -- the two alternate routes downriver from the confluence of the Winnipeg and Whiteshell Rivers at Nutimik. Thus, there would seem to be some possibility of the legitimacy of the apparent association between Blackduck sherds and Historic materials at EaKw-25 (see Dawson 1974, 1976; Steinbring 1980).

The excavated artifacts from the site failed to demonstrate the range of cultural affiliations or the abundance of recoveries suggested by the surface collections. These are illustrated as Plates 25, 26, 27a-r and 57. The most likely explanation is that the Blackduck occupation of the site was more extensive horizontally and/or situated on higher ground than the other components. Post-occupational erosion destroyed those parts of the site which contained the other components.

Sturgeon Falls (EaKv-2) 50°09'45" N x 95°39'55" W

R.S. MacNeish excavated the Sturgeon Falls site in 1953 utilizing a 95 x 5-foot trench located above the northwest end of the sand beach (MacNeish 1958: 42-46). The predominant pottery style at the site was characterized by fabric-impressed body sherds and undecorated rims, although some cord-impressed pottery occurred also. Accordingly, the material from Sturgeon Falls played a central role in the definition of the protohistoric Selkirk Focus.

The site soils are somewhat variable due to differences in elevation and drainage (Fig. 7), although all are identifiable as part of

Plate 5a. The Sturgeon Falls Site (EaKv-2) in 1953 facing east.

Plate 5b. The Sturgeon Falls Site (EaKv-2) in 1981 facing east.

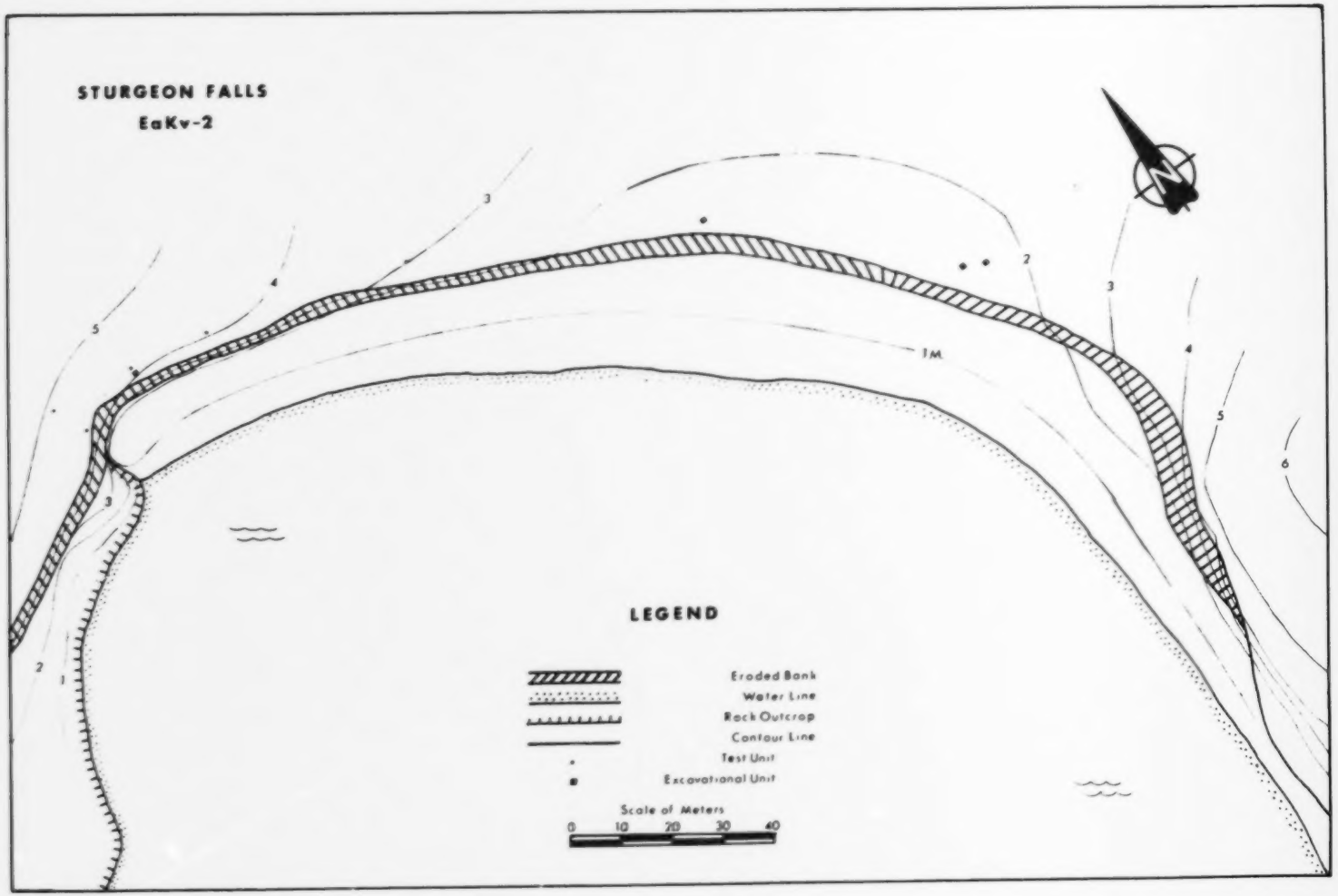


Fig. 7. Sturgeon Falls (EaKv-2).

the Indian Bay Complex (Smith and Ehrlich 1967). Generally, a substantial LFH zone (5 to 10 cm thick) occurs above a well-developed Ah horizon 10 to 15 cm in thickness. A dark gray B horizon underlies the Ah. The site is of relatively lower elevation towards the centre of the bank where heavy gleyed clays of a light bluish colour were observable. The site rises abruptly to a till feature at the extreme southern end of the beach, and this has let down a thick boulder talus which to some extent serves as a wave erosion barrier. As might be expected, drainage is rapid at the ends of the site, but quite poor near the centre. A fairly dense oak forest occupies the entirety of the excavated area and underbrush is extremely dense in the poorly drained centre.

The author has visited the site fairly regularly since 1975, and surface surveys have usually resulted in the collection of substantial amounts of material. The area is so well known to local collectors that it is commonly identified as "Indian Beach". An inspection of various surface collections that had been made at the site over the past 20 years indicated that a number of components were represented there which had not been recognized as a result of the MacNeish excavations. Accordingly, four $1m^2$ units and five $0.5m^2$ test units were excavated to evaluate the horizontal extent of the cultural deposits and their potential for excavation. The two units at the south end of the site produced a small amount of lithic debitage only and controlled surface surveys of this portion of the beach confirmed the virtual absence of ceramics in this region. The central unit was completely sterile despite the recoveries which had been made on the beach immediately below it. The units at the

extreme northwest end of the site, however, produced an appreciable amount of artifactual material, with fabric-impressed pottery predominating. Although most of the beach produced a uniformly high density of artifacts, pottery as a distinct artifact class was most abundant below these latter units. It was in this general part of the site that MacNeish had centred his excavations.

The Sturgeon Falls Site has suffered a considerable amount of erosion since 1953 (compare Plate 5a with 5b), but it is apparent that additional material remains in situ at the extreme northwestern end of the site. MacNeish tended to treat Sturgeon Falls as a single component of the Selkirk Focus, but this would not seem to be completely justifiable given the range of materials revealed by the subsequent surface collections and excavations (Plate 15, 16a-cc). The original horizontal distribution of the Laurel and preceramic components, for example, are difficult to assess, particularly in light of the destruction of much of the site over the last 30 years. It seems quite likely that lithic materials from other than the Late Woodland occupation were included in the assemblage identified by MacNeish. Additional excavations are necessary in order to shed light on this problem.

It is not anticipated that the return to normal operating levels of the dam at Seven Sisters will result in appreciable further erosion of the Sturgeon Falls Site, at least not in the foreseeable future. The fluctuation in the water levels of Lake Nutimik show a negligible correlation with Manitoba Hydro's water level controls due to the location of the site well upstream of the dam. Erosion of the intact portion of

the site seems to have been occurring at a relatively slow pace over the last decade. It would appear that the presence of artifacts on the beach after heavy rains or severe wave action is more indicative of reworking of the beach itself rather than erosion of the high bank behind it.

Otter Falls Rapids North (EaKw-27) 50°09'06" N x 95°48'40" W

Otter Falls Rapids North is situated on the north bank of the Winnipeg River along an extended peninsula which forms part of the rapids. Initial surface surveys indicated the presence of an appreciable amount of artifactual material, but additionally, the site was directly opposite one of the most prolific sites in the entire system. The latter is now largely eroded and located on private property, but it seemed reasonable that the same kinds of factors which were responsible for the abundance of occupational evidence on the south side of the river might obtain on the north side also. Much of the peninsula upon which EaKw-27 was situated seemed to have been little affected by flooding, and drainage appeared to be good, judging by the predominantly oak cover (Plate 6). Consequently, a total of 16 0.5m^2 units were excavated to an average depth of 30 cm along the length of the peninsula (Fig. 8).

Soil profiles were characterized by a thick (5 to 10 cm) LFH layer overlying a thin (or completely absent) Ah horizon. A thin (3 to 5 cm) Ae zone occurred beneath the Ah which in turn overlay a B zone (approximately 10 cm thick) and a C horizon which extended to granitic bedrock at highly variable depths across the site. Most soils consist of sandy clay over granite bedrock and boulder till. The northern half of the

Plate 6. Otter Falls Rapids North (EaKw-27) facing south.

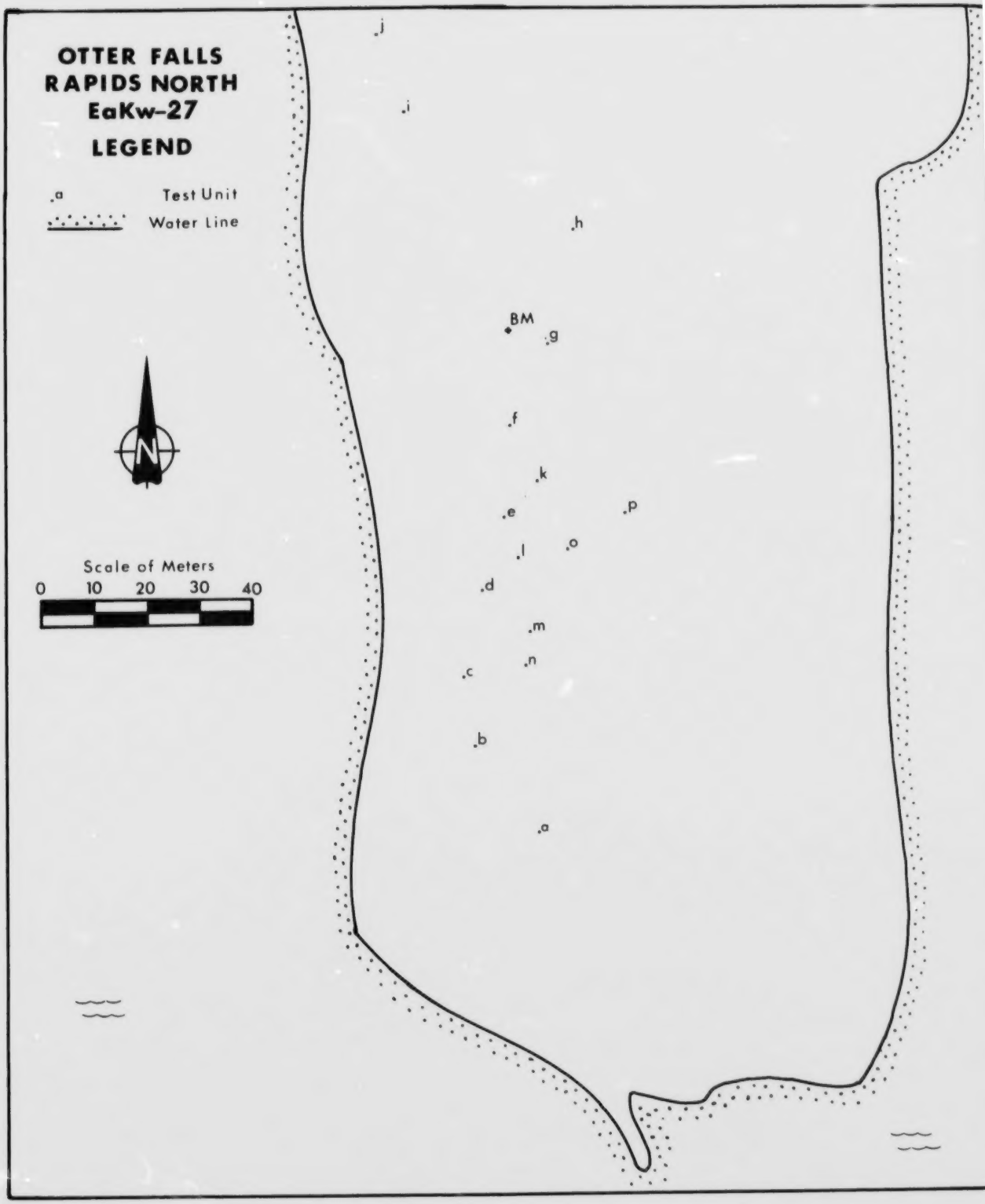


Fig. 8. Otter Falls Rapids North (EaKw-27).

peninsula, due to its lower elevation, has been subjected to considerable water erosion. This has contributed to the formation of a heavy clay-loam terrace covered with dense stands of marsh grass and littered with decaying vegetation.

The excavations produced artifactual material in virtually all of the units and served to confirm the presence of Blackduck and Laurel ceramics (Plate 30e-s) in a subsurface context. Unfortunately, the shallowness of the cultural deposition at the site precluded the possibility of vertically separating the components. As a result, excavations were suspended. The rather strategic location of the site strongly suggests that its primary function lay in its role as a short portage route by which the rapids (or waterfalls in prehistoric times) could be avoided.

Sylvia Lake No. 3 (EaKx-23) 50°08'28" N x 95°51'54" W

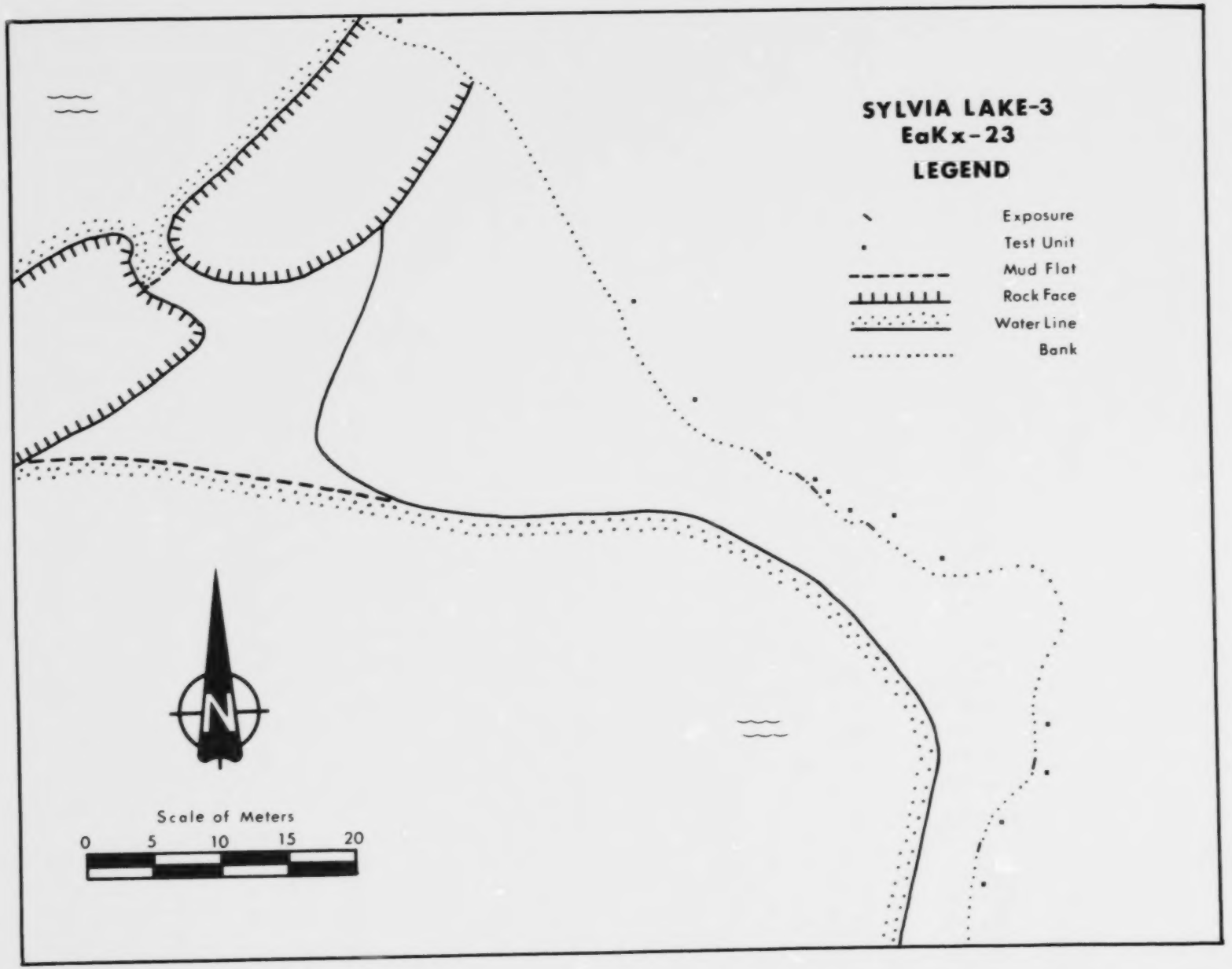
The initial surficial reconnaissance of EaKx-23 failed to reveal the presence of any artifactual material whatsoever. Shortly afterwards, however, Denis Thibault turned his collection over to us and upon examining the material it became clear that although very little had been collected from the site previously, all diagnostics pertained to the Plano period. Subsequent surveys yielded a considerable amount of lithics in the bay below the current water level. Blackduck ceramics were collected from the beach around the point to the north and, as these were separated by a considerable length of sterile shoreline, the Late Woodland and Preceramic loci were designated Syliva Lake No. 3 North and South, respectively.

The site consists of a relatively flat clay beach 4 to 10 m in

width which rises 0.75 to 1.0 m above the current level of Syliva Lake. Behind the beach, an eroded terrace rises abruptly to an elevation of approximately 2 m (Plate 7). The soil profile of the terrace is characterized by a thick (8 to 15 cm) LFH layer above a thin (0 to 2 cm) Ah zone, which in turn overlies a thick (8 to 10 cm) Ae horizon. Vegetation is predominately oak with a moderately dense second storey of underbrush. The ends of the site are defined by a 3-m-high clay bank over bedrock to the northwest, and by a high rock cliff to the southeast. Both of these latter features bear groves of spruce trees.

The excavations consisted of 13 0.5m^2 test units excavated to an average depth of 30 cm, and 6 bank exposures each 2 m in length. These were centred above those sections of beach which had yielded artifactual materials in the various earlier surveys (Fig. 9). With the exception of one of the bank exposures which produced a single flake, all of the units were sterile. Considering that all previously recovered artifacts had been located at the water's edge at times of low water, that the site had probably originally been occupied at a time of maximum depression of water levels, and that the level of Sylvia Lake has risen 2 to 3 m over the past 30 years in response to the damming of the system, this is not overly surprising. The Sinnock Site, however, had suffered flooding of similar magnitude but retained partially intact (Buchner 1981a). It is probable that no portion of EaKx-23 was situated on sufficiently high ground. The total destruction of the site could be confirmed by excavation of the high clay knoll at the northwestern end of the site, although the point of view that this area will not prove productive seems

Plate 7. Sylvia Lake No. 3 (EaKx-23) facing south.


SYLVIA LAKE-3
EaKx-23
LEGEND
Exposure
Test Unit
Mud Flat
Rock Face
Water Line
Bank
N
Scale of Meters
0 5 10 15 20

justifiable due to the absence of artifacts at its base. Surface recoveries from both the northern and southern loci of EaKx-23 are illustrated as Plate 46j and k and 46 l-p respectively.

RESULTS OF THE SURVEY

The surveys of both the 1980 and 1981 field seasons resulted in the assignment of 159 Borden numbers for Research Areas Nos. 1 and 2 combined. Some of these sites were divided into two or more discrete loci on the basis of allopatric distribution of artifacts. Such subdivision was most common in the case of small islands which, due to their extremely diminutive size, did not warrant more than one Borden number but which were characterized by rather different kinds of occupational debris around their circumferences. When these different materials were additionally separated from one another by sterile areas, or areas which would have been unoccupiable, they were distinguished from one another through the use of such suffixes to the Borden designations as "a", "b", "c" or "north", "south" etc. These more precise proveniences for surface materials are indicated for each artifact in the site catalogues. Counting such subdivisions as distinct localities results in the definition of 178 discrete loci for both research areas. A total of 54 sites was test excavated and nine were excavated by controlled means, the distinction being that in the case of the latter, the precise location of each of the excavational units is recorded and some method was employed to make vertical distinctions for the materials (if any) which were recovered. Sites were chosen for controlled excavation on the basis of previous surface reconnaissance

and/or the test excavations. Of particular interest were small loci which appeared to represent single components or extreme short-term occupations by an identifiable group, as well as larger sites at which the various components could be reliably separated by some means. Soil samples were taken from all excavated sites as well as from a number of other locations randomly selected from both research areas. These provide the basis for the statements of site erosion, both past and projected, presented in Appendix 1. Of the 178 defined loci, 68 bore insufficient materials upon which to define the presence of a recognized cultural component.

Statements of cultural affiliation were made on the basis of the usual set of "index fossils" which have come to stand as the defining attributes of the various recognized cultural complexes in this part of the province. The problems inherent in this kind of approach -- lack of comparability, observer bias, etc. -- are recognized (Buchner 1980b), but are fundamentally irresolvable given the nature of the material culture of the various groups inhabiting southeastern Manitoba throughout the Holocene. Our tendency is to identify Woodland components on the basis of pottery types and preceramic components on the basis of projectile point morphology. Clearly, these artifact classes are not compatible in a functional sense. If we maintain that projectile points are men's tools and that pottery was made and used by women, then another source of bias has entered the analysis. The absence of a preceramic point style or the absence of pottery at a site may be explicable in terms of site function and/or the peculiarities of the sexual division of labour practised by a particular group. While it is theoretically preferable to distinguish

components by a constant set of criteria (such as lithics), this is generally not feasible in the field. Although it can clearly be accomplished in some cases, such as the Laurel Triangular point style for the Middle Woodland Period in southeastern Manitoba, such lithic "fossiles directeurs" were not recovered from any locus which failed to produce the expected ceramic association.

There are, however, some significant deviations from the general rule of defining preceramic components on the basis of point styles. The term "Plano" was used in a broad sense and included the well-made classically formed point styles recognized over much of the Northern Plains as well as the more crudely fashioned styles associated with the recently defined Caribou Lake Complex (Steinbring and Buchner 1980). The trihedral adzes and distinctive biface styles associated with the lanceolate points at stations of the latter complex were also used to indicate a Plano component, but only in instances in which they conformed rigourously to the established definitional criteria.

The "Early Archaic" components were not defined on the basis of projectile points, as variability in styles and the frequent difficulty in distinguishing them from some Late Woodland forms is well-recognized (Reeves 1973). My personal view is that the side-notched end-scrapers frequently associated with "Logan Creek" or "Simonsen" projectile points are the only part of the tool-kit of the pre-Oxbow bison-hunting populations of the Northern Plains which can serve to identify them in the absence of controlled excavations or reliable age estimates (Buchner 1980c).

The term "Raddatz" as herein used includes point varieties also

known elsewhere as "Osceola" and refers to the "box-based" point styles which have from time to time been recovered in association with Archaic copper tools in eastern Manitoba (Buchner 1979). At Site LM-8 on Manigotagan Lake near Bisset, these were recovered from contexts dating to the earlier half of the second millenium B.C. When found as isolated objects in undated contexts, the term "Old Copper" is only used in reference to those copper specimens which conform to one of the classic styles identified by Wittry (1957) or more locally by Steinbring (1980).

Projectile points were the sole defining criteria for the Oxbow, McKean and Larter complexes. Certain other artifact styles and classes tend to be associated with some of these, but I am not as yet convinced that they are restricted to them. Since Reeves' (1970) article, many have adopted the more widely used term "Pelican Lake" for the late preceramic Plains-oriented complex characterized by corner-notched projectile points. A re-examination of the original Larter Site artifacts (Buchner 1980b) led me to suspect that the differences between Larter (as known from southeastern Manitoba) and Pelican Lake (as defined in Saskatchewan and Alberta) may be greater than is often conceded. While some of these differences are explicable in terms of differential seasonality, I do not believe that this holds in the case of projectile point morphology. In light of this consideration as well as the non-comparable time-depths of Larter (at the Bjorklund Site, for example [Buchner 1981b]) and Pelican Lake to the west, I prefer retention of the original term.

As aforementioned, Laurel, Blackduck and Selkirk components were defined solely on the basis of characteristic pottery styles. The term

"Historic" was used in specific reference to the foundations of old structures, iron tools, rifle and musket parts, reworked glass artifacts, musket balls, bale seals and coins dating to or prior to the operation of either of the dams. It was not applied to the numerous beer bottles, fishing lures or any of the other fascinating but very recent objects which litter some of the beaches in the Whiteshell. Pottery styles, projectile point styles or any other artifact class which could not be comfortably accommodated within any of the above cultural complexes are nonetheless illustrated (Plates 8 to 62).

Despite these definitional criteria, cultural identifications for some sites were more readily justifiable than for others. Consequently, identifications were classed as "possible", "probable" or "certain". A "probable" component was defined on the basis of at least one of the above diagnostic artifacts. Component identifications for each of the 178 loci are listed against the Borden designation and common name in Tables 1 and 2 which are appended to the maps of Research Areas Nos. 1 and 2, respectively. The components are only those recognized as "probable" or "certain". Consideration of "possible" components is restricted to the Manitoba Site Inventory Forms on file with the Historic Resources Branch, Department of Cultural Affairs and Historical Resources, Province of Manitoba. The exclusion of the "possible" or poorly defined components was believed preferable, as Tables 1 and 2 constitute the data base for part of the following analysis. Possibly incomplete but certainly accurate data are considered more useful than "complete" but definitely partially erroneous data, particularly as observer bias tends to consistently skew errors in a

single direction.

Tables 1 and 2 yield other kinds of information also. The second and third columns identify the tested sites and those excavated by controlled means. The final two columns reference the sites with the illustrations of the artifacts collected from them and indicate the priority each has been assigned for future investigations. The key to the latter is given in Table 1. In all cases, cultural affiliations are based upon all data available. These include materials collected by investigators of the University of Manitoba, University of Winnipeg, Manitoba Archaeological Society, Historic Resources Branch, and National Museum of Canada over the past 30 years, as well as artifacts which currently remain in private collections and hence cannot be satisfactorily illustrated herein. The latter are instead recorded in the field notes and field photographic catalogues on file with the Historic Resources Branch. Despite this shortcoming, Figs. 3 and 4, Tables 1 and 2 and Plates 8 to 63 constitute a convenient shorthand summary of the results of the 1980 and 1981 surveys and my gratitude is extended to the many individuals who permitted me to examine and photograph their collections. In some cases, this allowed the confirmation of components and, in a few instances, justified the identification of new ones.

The two seasons of survey revealed remarkably few sites of high priority. The Sinnock Site (EcKx-4 [Buchner 1981a]) is clearly the most significant site in either research area at the present time due to its integrity, unicomponent status, and unique position within the culture history of the province. EcKx-24 may have at one time been similar in

many respects to the Sinnock Site, but appears to have been destroyed completely due to post-depositional erosion. Test excavations failed to locate any subsurface material, but additional tests are planned for next season. The nearby EcKx-22, although particularly rich in material remains, failed to provide evidence of subsurface materials in a stratigraphic context. With regard to lack of vertical integrity, it was similar to the highly prolific EaKx-2, EaKx-17, EaKx-38 and EaKw-28 -- all multicomponent sites in Research Area No. 2. Most single component sites were by all indications very small and either completely or nearly completely destroyed by erosion. Although EaKx-23 (Sylvia Lake No. 3 South) seems to be a case in point, a minimum measure of additional surface surveys, particularly during times of depressed water levels, is highly recommended.

The 1979 excavations at the Cemetery Point Site (EaKv-1; Buchner 1980a) demonstrated that although much of the site had been eroded since the MacNeish excavations, subsurface materials pertaining to the virtual entirety of the cultural-historical sequence of southeastern Manitoba were still to be found in situ in a deeply stratified context. Similarly, the Sturgeon Falls Site (EaKv-2) and Otter Falls No. 7a and b (EaKw-25) are worthy of more attention than the scope or mandate of the Winnipeg River Archaeological Project could afford them.

COMPONENT CORRELATION

The surveys allowed the definition of 13 components of Palaeo-Indian affiliation, 60 of the Archaic period, 135 Woodland components and 35 which contained Historic material. The tabular presentation of these

data (Tables 1 and 2) permit the statistical manipulation of the results of the survey in a fairly straightforward fashion. A series of Chi-square tests were used to evaluate the deviation from randomness of the co-occurrence of every possible combination of two components at a single site locus. The basic form of the Chi-square distribution is $X^2 = \Sigma(\frac{(O-E)^2}{E})$. As 2x2 contingency tables were used, the number of degrees of freedom was equal to 1 in all cases. With such a low number of degrees of freedom, the problem of calculating inflated values for $X^2_{(calc)}$ due to expected values of less than 5 becomes particularly troublesome. For this reason, correction for continuity was employed; 0.5 was subtracted from the absolute difference between observed and expected values for each cell prior to squaring. Thus, the modified formula reads $X^2 = \Sigma\frac{(|O-E| - 0.5)^2}{E}$. This reduces the final amount of deviation from randomness for all cells and considerably reduces the degree of "significance" of the $X^2_{(calc)}$ value. The $X^2_{(crit)}$ value was set at 3.84, reflecting the 0.05 level of significance or 95% probability. An example of the format of one of the tables is given below in Table 3.

Table 3. Chi-square tabulation of Plano and Historic Sites.

	Historic artifacts present	Historic artifacts absent	Row totals
Plano artifacts present	8 (4.06)	5 (9.03)	13
Plano artifacts absent	26 (29.94)	70 (65.06)	96
Column totals	34	75	109

The bracketed figures represent the calculated expected (E) values. Utilizing the corrected X^2 formula given above, the equation is solved as follows: $X^2 = 2.915 + 1.380 + 0.395 + 0.303 = 4.993$. As the calculated value exceeds the critical value (3.84) at the 0.05 confidence level with 1 df, we may be 95% sure that Plano and Historic materials tend to occur at the same sites.

Approximately 50 such tables were computed for each possible pairing of components (those components which occurred at less than 10 loci were ignored), and thanks are in order for the University of Winnipeg computer centre for alleviating what would otherwise have been a most tedious task. Only three pairings produced significant results at the 0.05 level: Plano-Historic ($X^2_{(calc)} = 4.993$), Oxbow-McKean ($X^2_{(calc)} = 4.590$), and McKean-Larter ($X^2_{(calc)} = 4.695$). Re-examination of the individual cells contributing most greatly to the observed deviation from randomness indicates that in all cases the significant values are the result of a higher-than-expected association of the two components rather than a "mutual avoidance" of components of the respective "cultures". Needless to say, the anthropological significance of this analysis cannot be perceived in the numbers themselves, but must involve the rational interpretation of the numbers in light of what we already know about these various techno-adaptive configurations.

The Plano-Historic correlation was considered rather interesting as it was so unexpected. Reflection on the nature of the sites occupied by Palaeo-Indians and the Historic inhabitants of the area reveals that there may well be a sound micro-environmental explanation for this apparent

similarity of site selection strategies, and that the correlation should not be considered spurious prematurely. As these "cultures" occupy opposite ends of the cultural-historical spectrum, we must recognize that substantial environmental changes have occurred which would result in the same sites having markedly different attributes in each time period. It has been suggested (Buchner 1981a) that local Palaeo-Indian sites tend to be located at narrowings of the Winnipeg River which presumably reflects the interpretation that these people were exploiting herd animals at natural points of crossing. Most, if not all, of these occupations date to the Atlantic Climatic Episode -- a period characterized by less effective moisture and a dramatic lowering of the water table (Buchner 1980c). As a general example, even the relatively mild droughts of the 1930s succeeded in lowering the level of the Winnipeg River at Great Falls by as much as 5 m. The amelioration of the Altithermal was associated with a rise in water levels to more nearly approximate the modern situation, and thus many of these early sites must have been flooded, while others were reduced to swamps. Most of the Historic structures located in the course of the surveys were found in swamps, and Historic artifacts were frequently located on beaches which lay immediately below marshy areas.

The reason for this apparently masochistic site selection strategy is evident. The rudely constructed Historic shelters were located in swamps for use during the winter months by individuals engaged in trapping and hunting. Swamps made ideal winter camps; as the ground hardens, they are generally well sheltered from all directions and have very little undergrowth. Thus, the coincidence of Plano with Historic sites may only

partially be reflective of a similarity of use to which these areas were put by both groups of people (in this case, probably hunting). The level of most of the Winnipeg River throughout recorded history is much closer to its modern level than the latter is to its level in the mid-Holocene. As a consequence, the sample of Historic materials collected is more fully representative of the number of loci utilized during the Historic period than is the Plano sample for the Palaeo-Indian period. Many Plano sites must currently lie well below the modern level of the Winnipeg River, at elevations where no Historic activity ever took place. Similarly, at elevations well above that of the present river level, Historic structures (at least) would be considerably more visible than the relatively deeply-buried Palaeo-Indian artifacts. Early Europeans and Palaeo-Indians did not tend to occupy the same geographical areas; we simply tend to find evidence of both groups in the same places.

Differential environments are considerably less of a problem in the case of the Oxbow, McKean and Larter complexes, as they all tend to be restricted in time to the Sub-Boreal Climatic Episode (Wendland 1978) dated at 3110 to 810 B.C. As a result, the correlations noted for the above are of greater cultural significance. Together, these complexes form the vast bulk of the evidence for occupation of southeastern Manitoba during the Archaic period. Although there is a tendency among some to see these phases as largely contemporaneous, I tend to view them as essentially sequential, regardless of how unfashionable this may seem. While it is true that a fair amount of overlapping of the three time-depths is apparent if one considers all acceptable radiocarbon dates from all of

North America, considerably less contemporanity is evident if one restricts examination to a given region. Fortunately, all three complexes are well-controlled radiometrically at a number of sites nearby the research areas. Two radiocarbon assays of 2910 B.C. and 2675 B.C. at the Whitemouth Falls Site near Seven Sisters clearly give the Oxbow Complex archaeological priority over McKean and Larter in the area. The latter date was based on a sample of butchered bison bone in association with a number of the distinctive eared projectile points. Four southeastern Manitoba McKean dates are available: 1780, 1750 and 1585 B.C. -- all charcoal dates from the lowest component of Site C-5b on Caribou Lake near Bissett, and 1455 B.C. from Whitemouth Falls. Like the Oxbow date, the latter was based on a sample of butchered bison bone. A suite of seven dates ranging from 1175 B.C. to 755 B.C. were received on bone and charcoal samples from the Bjorklund Site, located directly across the Whitemouth River from the Whitemouth Falls Site. From all current indications (Buchner 1981b), these peoples subsisted primarily on bison with some minor dietary supplementation of beaver and possibly sturgeon.

This rather specialized way of life should be reflected in the locations of the sites selected by peoples of each of the three complexes and this does appear to be the case. Oxbow populations tended to occupy the same kinds of sites later to be utilized by McKean peoples. The latter, in turn, chose the same kinds of sites as peoples of the slightly more recent Larter Phase. From one point of view, these correlations are not surprising, given the fact that a "good" site will remain a "good" site for similar peoples at a different point in time assuming that no major

environmental change takes place. At the same time, however, it must be recognized that the locations of Woodland sites do not correlate despite the fact that Laurel, Blackduck and Selkirk peoples appear to have exploited similar kinds of resources, the variety and diversity of which stand in sharp contrast to those utilized by their Archaic predecessors. Additionally, Archaic sites are less than half as numerous as Woodland sites in the research areas, and hence, purely from a statistical standpoint, we might anticipate fewer correlations in the locations of Oxbow, McKean and Larter sites. The inevitable conclusion is that Archaic peoples, due to their more specialized economy, must have been more constrained in their choice of sites than later, more diversified peoples. The precariousness of a subsistence base increases in proportion to the degree to which it is specialized, and the nomadic hunters of the preceramic period must have been cognizant of this basic fact. The most effective strategy for specialized peoples whose resources are available on a seasonal basis is to occupy locations at which the fullest possible range of exploited resources co-occur. In this fashion, a "good" site must be defined in terms of one which minimizes the risk of failure, rather than one which <u>might</u> maximize returns from a single resource. Despite the relatively low population density during the Archaic, there was apparently more "population pressure" than at any other time. Although site selection strategies for these three complexes are seen as generally similar, there is clearly some change in the geographical aspects of site location throughout the Archaic. If this were not the case, the locations of Larter sites would correlate with the locations of Oxbow components. As this is not the case, we must assume that

the Oxbow-McKean-Larter trajectory represents a continuum of adaptive strategies within the basic nomadic hunting and gathering pattern. The minor shift in the specific locations of sites from one end of the continuum to another may reflect an adaptive shift, perhaps in terms of increasing diversification, or it may simply be an artifact of subtle but ongoing environmental change throughout the Sub-Boreal Climatic Episode. At present, it is difficult to determine which factor is operative or if both are contributing to the observed trend.

The Woodland Period is represented by more than twice the number of sites identified for the Archaic. Although it is extremely difficult to translate this into actual (even relative) population figures, it would seem that there was something of a population explosion in the Christian Era. Elsewhere (Buchner 1979) I have suggested that the appearance of the Laurel Culture in southeastern Manitoba represents the in-migration of a new group of people from the Upper Great Lakes region who, over the course of several hundred years, gradually shifted their seasonal camps to the north and west in response to the expansion of the environmental zone to which they were adapted. These people had a long tradition of economic diversification and continued this pattern once they had established themselves in what is now Manitoba. Regional archaeological sites (Buchner 1979, 1980a, 1980d, 1981b; Carmichael 1977; MacNeish 1958) reveal a profound array of utilized resources, including several varieties of fish, riverine mammals, large ungulates, migratory wildfowl and, perhaps most important of all, plants -- particularly wild rice. This diversification is undoubtedly the key to understanding the proliferation

of Woodland sites as well as the specifics of their distribution. Despite the number of recognized Woodland components and the general similarity in the reconstructed lifeways of Laurel, Blackduck and Selkirk peoples, there is no tendency for sites of the various phases to occur in the same geographical locations. Once again, environmental changes can largely be ruled out as all of the Woodland Period occurs within the Sub-Atlantic Climatic Episode which is characterized by only a few, minor climatic fluctuations (Bryson and Wendland 1967). It seems inescapable that, from a purely economic point of view, and for most of the year, virtually any location along the Winnipeg River could produce at least one of the many resources upon which these people depended. There was no need to find a "good" site in most cases, as there were so many of them near at hand. This diffuse subsistence base must have been more secure than the specialization which characterized the preceramic period, and the absence of correlations of Woodland site locations clearly demonstrates that this new way of life resulted in less "resource stress" than had been the case previously -- despite the increase in absolute population size.

SITE DISTRIBUTION

It seems axiomatic from the nature of the data that surveys produce distributional studies. Fortunately, in the case of the Winnipeg River surveys of 1980 and 1981, a distribution analysis complements the component correlation and, when used in connection with the data gleaned from a decade of controlled excavations throughout the two research areas, serves to enhance the state of our knowledge of Manitoba's prehistoric peoples.

In the earlier report, it was noted that in Research Area No. 1 Plano sites and isolated find spots of Plano materials were located on the east bank of the Winnipeg River at what would have been narrowings during the hot, arid interlude in the mid-Holocene. This was interpreted as indicating that these stations were employed as temporary hunting camps utilized by people in the fall months for the exploitation of herd animals during the latter's "migration" into the shelter of the forest edge for the winter. It was hypothesized that the east bank was the preferred one for such activity as it would be toward the east bank that the animals would be moving and hence the hunters could dispatch the animals fairly readily as they emerged from the water. Additionally, as the prevailing winds at that time were from the west, the hunters would have been situated so as to be downwind of their approaching prey (see Buchner 1981a for a detailed discussion). Finally, it was suggested that data relevant to the confirmation or rejection of this reconstruction might be collected from Research Area No. 2 in the 1982 field season.

Comparison of Figs. 10 and 11 illustrates that the preference for narrowings in the river characterizes the distribution of early sites in Research Area No. 2 as it had for Area No. 1, although in the former there appears to be no evidence to support the preference of one side of the river over the other. The explanation for this seems to be inherent in the supportive data for the site distribution in Research Area No. 1. Unlike the latter, the Winnipeg River within Research Area No. 2 runs in an east-to-west direction. Thus, the prevailing westerlies would have paralleled the course of the river and there would have been no strategic

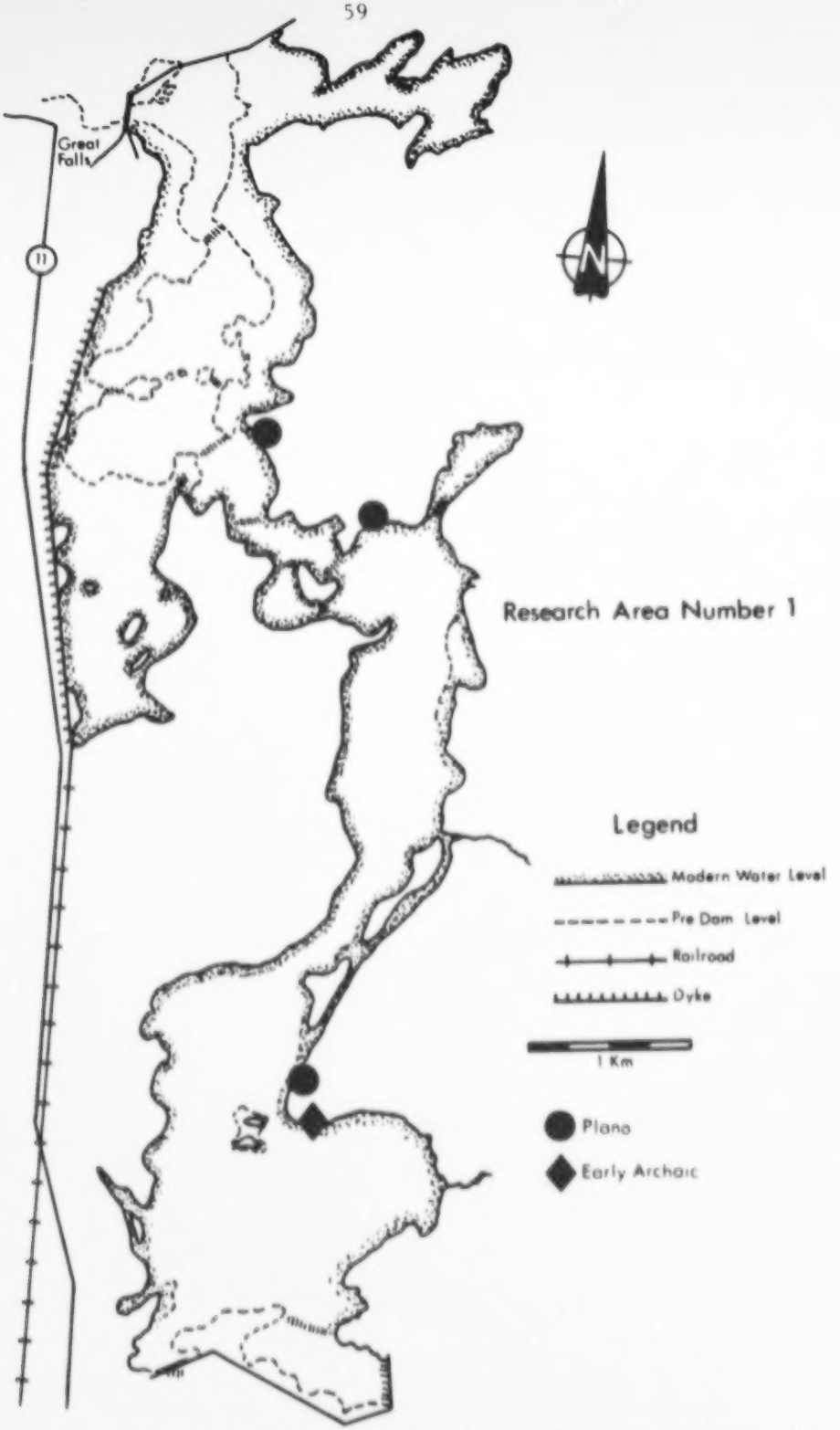


Fig. 10. Plano and Early Archaic site distribution in Research Area No. 1. Overlapping symbols indicate the presence of more than one component at the same site or site locus.

advantage to locating a hunting camp on a specific sit
of view. Considering only the hunters' ability to
side would have been as efficient as the other. Per
importance was the consideration involving the hunte
areas characterized by landforms which allowed them
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Lake and those centrally located on and near Channel
are located on, or in direct proximity to, high sand
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All of these sites are located at natural crossing
the course of the last three field seasons, animal
crossing at all of them. The 1981 field season se
even considering the possible effects of the operat
Dam far downstream, it seems justifiable to conclud
the eastern part of the Research Area at least more
those of the Altithermal than at any time previously.
Whiteshell River which separates the DeWitt Sites
from the Cemetery Point Site (FaKv-1) essentially
extensive sand bar was exposed at the mouth of the
blocked the river mouth entirely and the river could
Sturgeon Falls, although still characterized by a fast
was certainly not a "falls" in the true sense and a
greatly narrowing the river at this point. With an
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advantage to locating a hunting camp on a specific side from this point of view. Considering only the hunters' ability to remain concealed, one side would have been as efficient as the other. Perhaps of greater importance was the consideration involving the hunters' selection of areas characterized by landforms which allowed them to spot the animals from a distance. In this regard, both the eastern Plano sites on Nutimik Lake and those centrally located on and near Channel and Carter Islands are located on, or in direct proximity to, high sand banks or rock cliffs. Those on Natalie Lake occupy a large expanse of flat, unbroken ground. All of these sites are located at natural crossings of the river and over the course of the last three field seasons, animals have been observed crossing at all of them. The 1981 field season was exceptionally dry and even considering the possible effects of the operation of the Seven Sisters Dam far downstream, it seems justifiable to conclude that water levels in the eastern part of the Research Area at least more closely approximated those of the Altithermal than at any time previously. During 1981, the Whiteshell River which separates the DeWitt Sites (EaKw-7 and EaKv-30) from the Cemetery Point Site (EaKv-1) essentially stopped flowing. An extensive sand bar was exposed at the mouth of the river which nearly blocked the river mouth entirely and the river could be easily crossed. Sturgeon Falls, although still characterized by a fast-flowing current, was certainly not a "falls" in the true sense and a rock shelf was exposed, greatly narrowing the river at this point. With an additional (but slight) reduction in flow rate, the river would have been readily crossable at this point by both large herd animals and pedestrian human populations.

The various channels of the Winnipeg River around Channel and Carter Islands tend to be quite shallow. It is a fairly simple matter to cross from one island to the other and from Channel Island to the north bank of the river even today, 30 years after the construction of the dam which raised the river a minimum of 2 m at this point. Sylvia Lake No. 3 (EaKx-23) on the northwest side of Carter Island is situated in a small bay at the foot of an only slightly submerged granitic peninsula which extends the greater part of the distance to Porcupine Island. The latter is separated by only 6 m of fairly shallow water from the south bank of the Winnipeg River.

The distribution of artifactual and faunal remains clearly attest to the fact that both human populations and large gregarious herbivores crossed the Winnipeg River during the Palaeo-Indian period; and the location of the hunting camps of Plano peoples at what are today points of easiest crossing supports the view that animals must have used these specific routes over a number of years in their movements from the grasslands and mixed forests south and west of the river to the mixed and coniferous forests of the north and east banks. Wind direction must have been an important consideration in the selection of a hunting camp, or Plano sites would be anticipated on the west bank of the Winnipeg River in Research Area No. 1 and on the west and southwest shores of Sylvia, Eleanor and Nutimik Lakes. But other factors such as river width and depth, current speed and visibility were also critical. Given the varied topography of the area and the meandering course of the river, a great number of locations would have been serviceable as hunting camps for Plano

peoples. Undoubtedly many Plano sites have been destroyed by erosion due to the construction of the numerous dams along the system.

The amelioration of the aridity generally associated with the Altithermal must have brought about considerable microenvironmental (floral and faunal) changes as well as an alteration of the landscape. Undoubtedly, some small, low-lying islands were flooded while new ones were formed from what had previously been peninsulae. The three millenia subsequent to 3000 B.C. also witnesses a heightening in the amount of evidence for human utilization of the area. Identifiable sites quadruple in number from those assignable to the Plano and Early Archaic time period, and the appearance of Oxbow projectile points below McArthur Falls comprises the first solid evidence for human activity on the west bank of the Winnipeg River in Research Area No. 1 (Figs. 12 and 13). Narrowings in the river continue to be centres of occupation but appear to be less important than previously. Archaic sites are also located at some of the widest portions of the river, on many of the small islands which lie a considerable distance from the mainland, and in the highly physiographically varied region on the north shore of the Winnipeg River near the centre of Research Area No. 2. The diversification of sites selected as well as the occupation of areas apparently unexploited by earlier peoples bespeaks something of a shift in the resources which were exploited and/or the manner in which they were exploited. As with the earlier period, Dorothy Lake appears to have been essentially unoccupied.

Figs. 14 and 15 illustrate the distribution of Woodland period sites in Research Areas No. 1 and 2 respectively. Despite the fact that

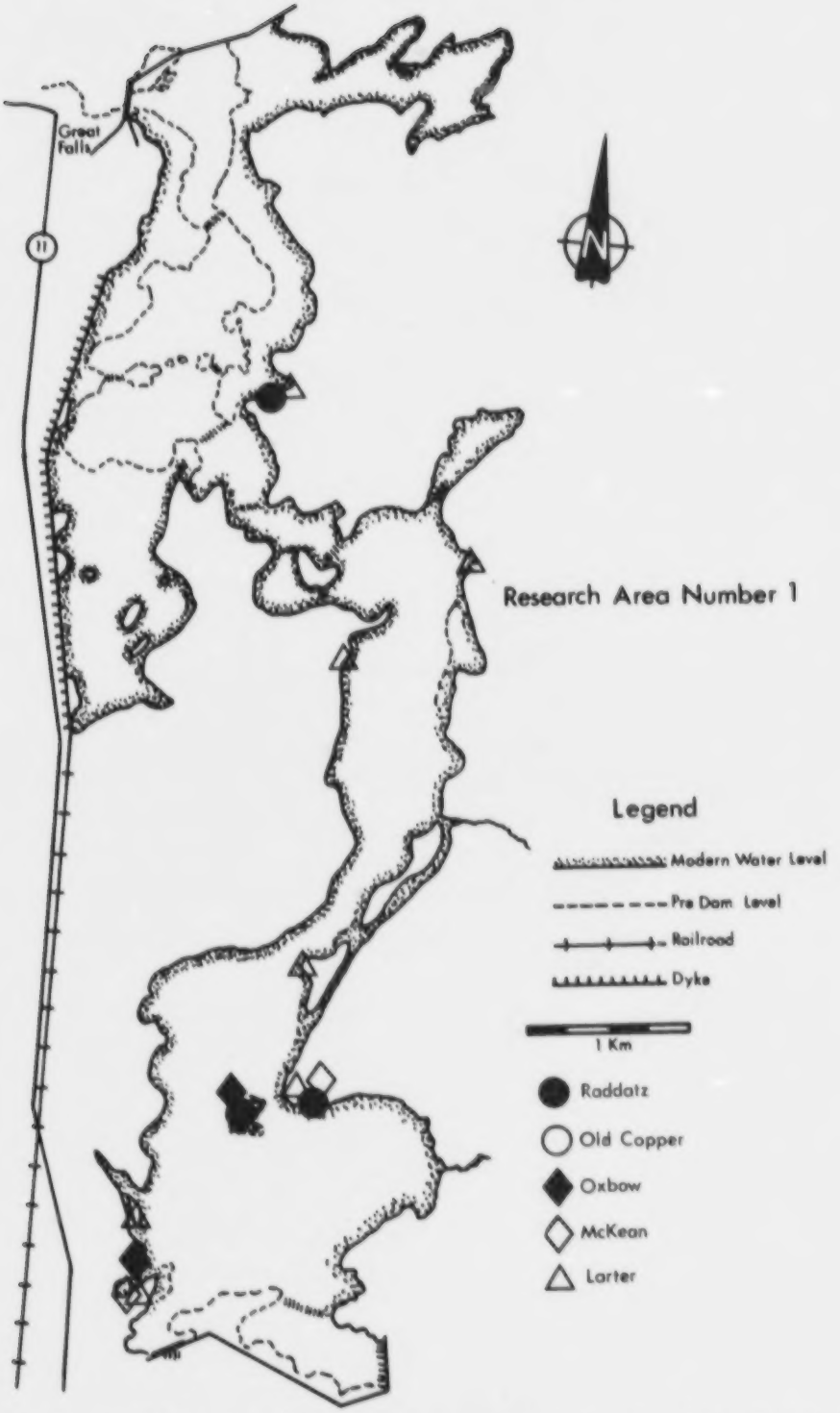

Fig. 12. Raddatz, Old Copper, Oxbow, McKean and Larter site distributions in Research Area No. 1. Overlapping symbols indicate the presence of more than one component at the same site or site locus.

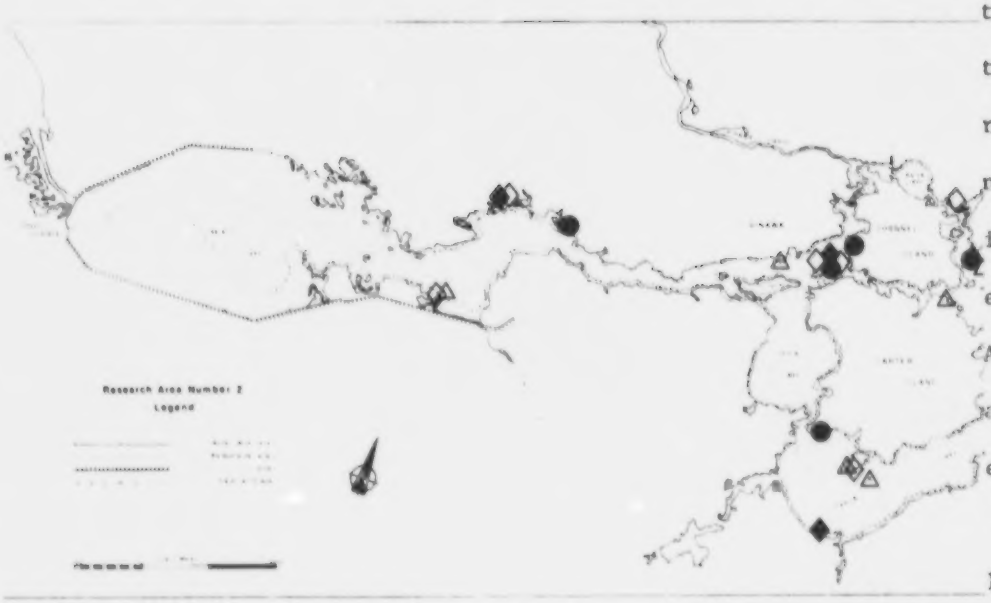

Fig. 13. Raddatz, Old Copper, Oxbow, McKean and Larter site d the
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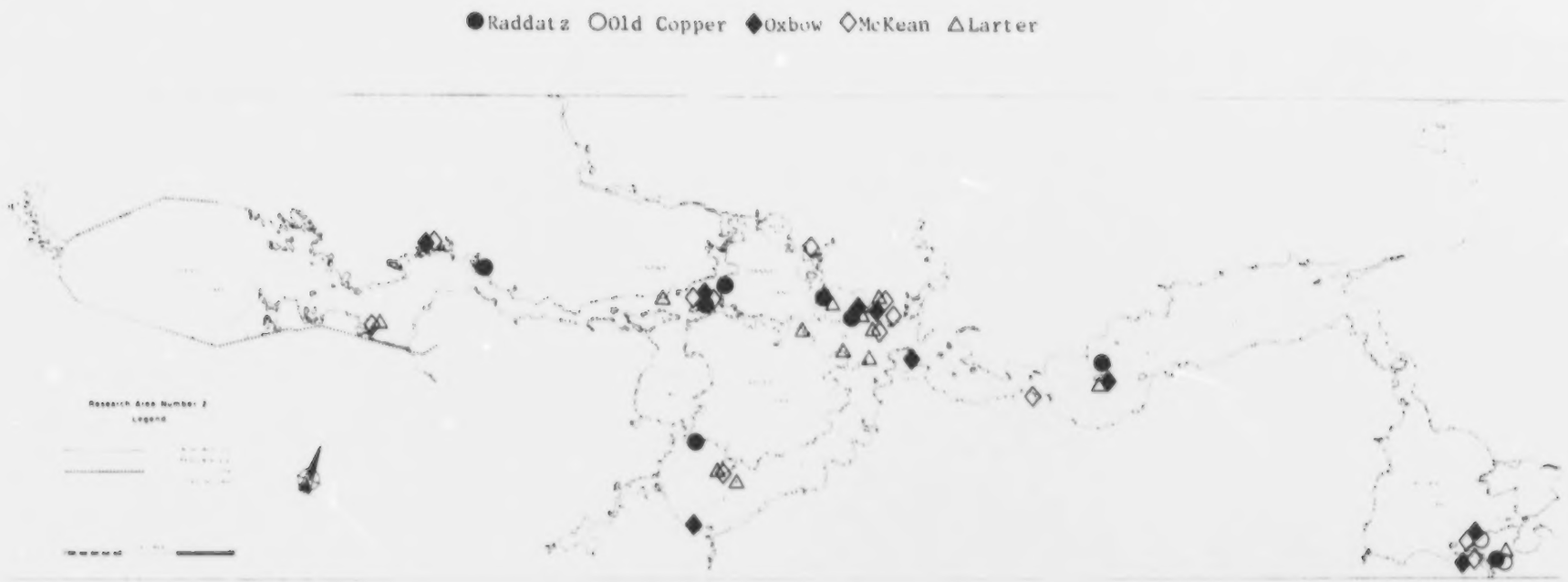

Fig. 13. Raddatz, Old Copper, Oxbow, McKean and Larter site distributions in Research Area No. 2. Overlapping symbols indicate the presence of more than one component at the same site or site locus.

the time depth involved is approximately one-half that of the preceeding period, twice as many loci of activity are recognized. This may be partially attributed to the fact that due to the presence of pottery at most Woodland sites, these later sites are more readily identifiable than earlier, purely lithic components.

Islands appear to be particularly favoured locations for sites, thus demonstrating the extent of the reliance upon watercraft on the part of Woodland peoples. Later period sites are generally absent in the western half of Research Area No. 2, and this must be interpreted in terms of site destruction in the immediate forebay of the Seven Sisters Dam. Woodland sites which do occur on Natalie Lake and along the banks of the Winnipeg River upstream as far as Pinawa tend to be extremely small, in a few cases represented by only a handful of water-worn sherds. This general kind of explanation for site absence seems even more germane to the situation in the forebay of the Great Falls Dam in Research Area No. 1, where no site of any kind could be located in the course of the 1980 surveys. Although Dorothy Lake appears to be fairly heavily occupied during the Woodland Period, these sites too are extremely small, many of them in fact simply being isolated find-spots. The reason seems to lie in the general shape and orientation of the lake itself. The lake is particularly susceptible to the strong westerly winds which are common throughout the summer months. In the absence of natural windbreaks, wave action becomes severe to the east of the small cluster of islands at the west end of the lake. The islands themselves, however, yielded abundant evidence of Woodland occupations, as they would have enabled their occupants

to find shelter from wind and waves originating from any quarter simply by selecting different sections of shore at which to land canoes.

Different site selection mechanisms, however, are obviously operative in the case of Woodland sites located on and in the general vicinity of the extremely large islands (Carter and Hind) in the centre of Research Area No. 2. This region in this time period indisputably contains the highest density of archaeological sites thus far defined for south-eastern Manitoba. Some of these stations, particularly the small artifact scatters which may well represent extremely transient occupations, probably relate to the "crossroads" role that the junction of the Pinawa Channel and the Winnipeg River seemed to have played throughout much of prehistory and in the early Historic Period. Research Area No. 2 is situated very near the margins of three major resources areas: the grasslands and Aspen Parkland to the south and west, the coniferous forests to the north and the mixed coniferous-deciduous forests to the south and east. A diversity of faunal species inhabited these different regions at various times in the past (bison to the west as known from the Whitemouth Falls and Bjorklund Sites; woodland caribou and moose to the north; white-tailed deer to the southeast) and floral resources vary also. In particular, the Whiteshell River which drains into Nutimik Lake contains some of the richest stands of wild rice in the province. This diversity of resources, many of them more readily available in some seasons rather than others, must have played a central role in the establishment of resource exploitation strategies of Manitoba's earlier inhabitants, and it seems fundamental that a seasonal round of activity was employed to encompass two or more of

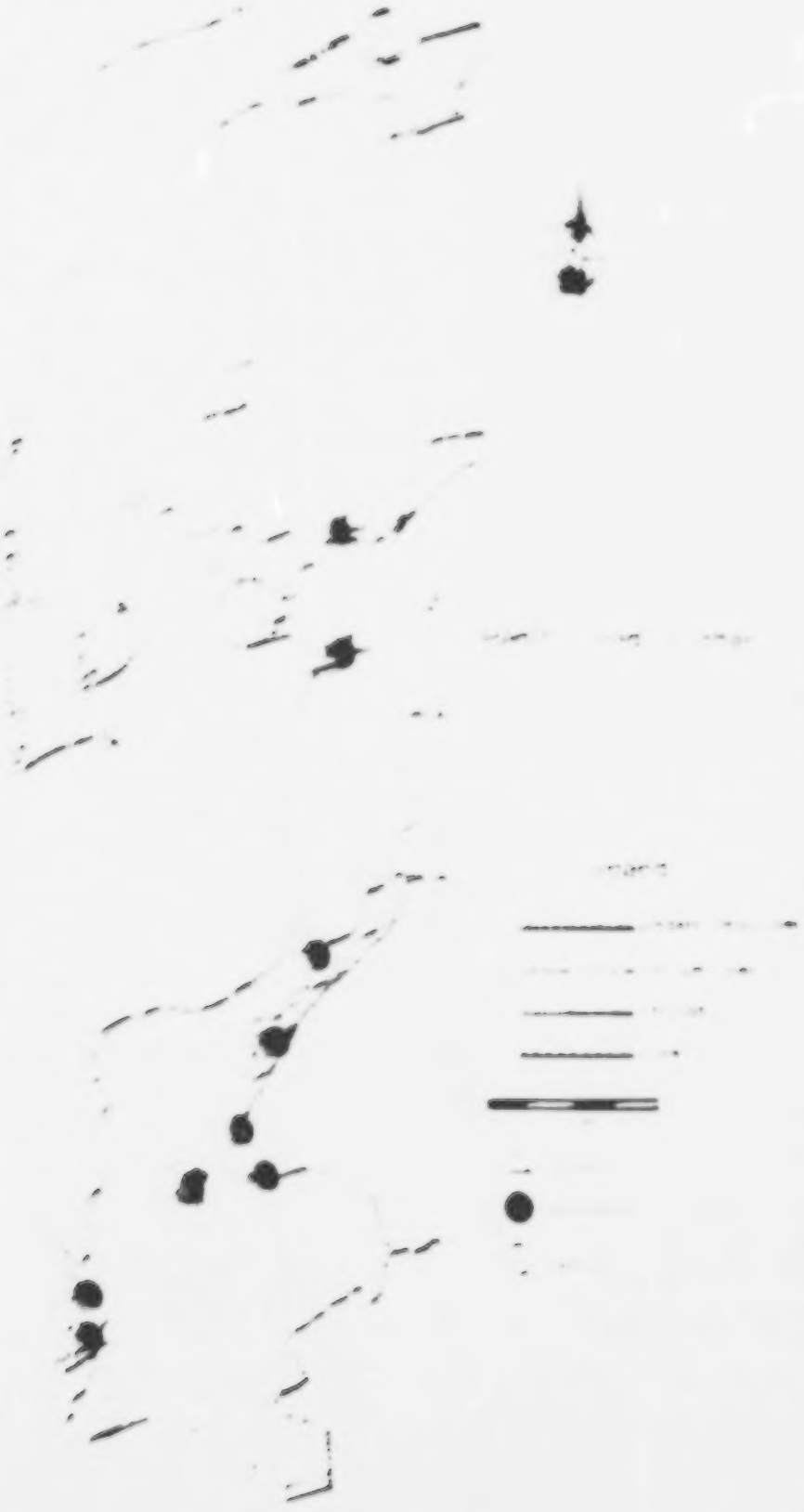

Fig. 15. Laurel, Blackduck and Selkirk site distributions in Research Area No. 2. Overlapping symbols indicate the presence of more than one component at the same site or site locus.

these zones throughout the course of the year. The Winnipeg River and Pinawa Channel are not only the obvious corridors for transportation between these zones, but in many cases the only feasible routes. Thus, peoples travelling back and forth from the Aspen Parklands to the mixed deciduous zone, or from the northern forests to either of the two southern zones, would of necessity have passed by the major islands which lie at the source of the Pinawa Channel and which trifurcate the main course of the Winnipeg. The most southerly route (Eleanor Lake) around the islands bears less evidence of prehistoric activity, as it is the longest of the three alternatives and, regardless of weather conditions or water levels, it would have nothing to recommend it over one of the other two. It would seem to be less than coincidental that this central region contains not only the greatest density of sites known from either research area, but also four of the six largest sites identified to date (EaKx-9, EaKw-29, EaKw-25 and EaKw-28). Before the operation of the Seven Sisters Dam, it is entirely possible that these were all larger than the only other "major" sites in the area -- Sturgeon Falls and Cemetery Point -- as these latter stations have suffered considerably less erosion than those further west.

APPENDIX 1

EROSIONAL DYNAMICS OF ARCHAEOLOGICAL SITES ALONG THE WINNIPEG RIVER

Michael J. Daly

March 1982

INTRODUCTION

The analysis of the Seven Sisters Reservoir Soils (Research Area No. 2) was conducted between November 1981 and February 1982 under contract to the Historic Resources Branch, Province of Manitoba. The focus of this report is the erodibility of sites along the river embankments. Wave action on the banks is considered in light of its contribution to the erosion of certain soils. Field observations of the condition of sites and how wave action is eroding banks and causing the formation of beaches is included as part of the site description. Beach and bank morphology (length, width, and angle of repose) are given as coarse estimates.

METHODOLOGY

Samples were collected from various sites in the research area (see Fig. 4). Attention was paid to those areas of the site which were eroded and to the areas immediately behind (1-10m) eroded embankments or beaches. In total, 18 sites were sampled and 94 samples were taken. Soils were taken in 200-300 gram bags. The samples were recorded by site, test unit, and observable soil horizon. Site description includes vegetation cover, length, width, soil cover, height of water, length and width of beach (if any) and bank height. From this information, the extent to which erosion will occur can be roughly estimated using a beach erosion model. The erosion of a beach will be affected by the vertical rise in water level as well as the product of wave energy. Since this model projects the maximum extent of erosion, the method used will be predicated upon maximum wave energy (gale force waves). It is important to underscore

the coarseness of these approximations as no planimeter or other standard geomorphological bank morphologic measurements were carried out as part of the research design. Should future work be considered necessary for this information it could be easily accomplished by a two-person field crew during a regular field season operating as an adjunct to site survey. Other tests, such as the particle size/liquid-limit tests, generally indicate the order in which the clay soils will behave in a liquid fashion under saturation with water. At the liquid limit, the embankment reaches a critical stage of susceptibility to erosive wave forces. Comparison of the morphology of embankments and rates of erosion to the particle size/liquid-limit of a soil may also be made.

The results of the analyses of the material are included in the tables on file with the Historic Resources Branch. These incorporate the particle size analysis experiment and the Atterburg cup liquid limit test. The beach models for estimating the amounts of erosion were taken from field observations and were applied to Dubois' (1977) model of $a/\tan \emptyset = X$, where 'a' equals the vertical height of a rise in water level over the tangent of $\emptyset$ (the slope of the beach). 'X' therefore equals the amount of horizontal recession that can be expected at a unit rise of water level. The model is fairly simple to apply where the beach sediments and the cliff sediments are of the same material. Large objects like boulders, latticeworks of deadfalls, and granitic slopes obfuscate the situation.

THE SITES

The Whiteshell River Site (EaKv-31)

This site is located on the east bank of the Whiteshell River, 200 - 300 m upstream of its mouth on Nutimik Lake. The site consists of a low, fairly level clay soil 1.5 - 2 m above the 1981 river level. The clay bank is inclined at 35° to the water level. A series of three small river terraces step down toward the river. The vegetation cover of the site is a poplar forest with thick grass cover near the terrace edge with second storey (bushes, small trees, etc.) cover further inland (15 - 20 m). The river terraces are covered in a heavy saw-grass, thistle and moss mat with a few open patches of clay. Erratics are present along the length of the site. In late spring of 1979 the water was 1 m higher than in 1981 and most of the exposed, sloped bank was under water. The thick grass and moss mat (except for the saw-grass) are of recent, pioneering origin. Test pits were placed on the bank terraces as well as the top. Artifacts were present in all pits. The surface of the bank units had a high silt content, the origin of which is fluvial. The deeper clays of the terraces have less silt and are probably more indicative of original lacustrine conditions. Bank morphology of small river terraces is highly variable and so with the rise in water levels expected in 1983, the shape of the bank will alter markedly. The site is generally of a high clay (from the soil classification pyramid) content (71.8%) with a high moisture content before it reaches the liquid limit. Wave erosion cannot be a significant factor at this site as the channel is quite narrow. Sediments will be eroded by stream processes

like meander cutting, but it is anticipated that this site will be eroded at a slower rate than those sites open to wave action along the lake shores.

Dorothy Lake 10 (EbKw-11)

DL10 is situated on a sand/clay beach which rises to a 1 m high clay bank. The site is 300 m east of a creek near the centre of the north shore of Dorothy Lake. The eastern part of the site has a sand bar over an organic horizon. There is no high clay bank at this part of the site and there is evidence of extensive flooding inland to an extensive Black Spruce bog. Clay beneath the organic horizon is of a clay-loam type common to sites along this north shore. The beach at the base of the cliff at DL10 stretches 20 m at a 5° slope to the [illegible]. The morphology of the bank indicates direct wave action and down-cutting by surface vegetation (forest canopy) collapse. Estimates for bank recession at the site upon return to normal operating levels is 3 m at .6 m/year.

Dorothy Lake 11 (EbKw-12)

DL11 includes both banks of the mouth of the boggy creek on the north shore of Dorothy Lake. The site consists of a clay beach 25 m in width sloping down to the water at 5°. There are clay cliffs 1 - 1.5 m rising vertically at the back of both beaches. The beach and sand show direct evidence of wave erosion by undercutting of clay banks and collapse of the forest canopy. Erosion occurs primarily as a result of spring flood conditions. Based on the beach erosion model used here (Dubois 1977),

the banks are currently just beyond direct wave erosion, even assuming a return to normal operating conditions. The soil is of an Indian Bay Complex type (Smith and Ehrlich 1967) being a clay-loam under a pine-spruce forest. The soil has a liquid/limit of 38.6%, and if this is an indicator of its greater ease of erodability, it would account for its more stable position in bank recession as compared with many nearby sites.

Dorothy Lake 13 (EbKw-13)

DL13 is located in a small bay on the north shore of Dorothy Lake. The beach is 15 - 20 m wide, rising at a 5^{o} slope to a low clay cliff of an Indian Bay Complex (Smith and Ehrlich 1967) soil (clay loam) type similar to DL10 and 11. Similarly, it has a spruce-pine forest cover. The site is angled away from the prevailing wind direction and the bay may have sheltered it from direct wave action. An estimated 5 m of further bank undercutting will occur at this site at a rate of .5 m/year. This site has a liquid limit of 34.6% with a 36% sand content. In terms of soil structure, it is as susceptible to wave erosion as DL11.

Opapiskaw 3 (EbKw-18)

This site consists of a cobble and clay-silt beach overlying granitic bedrock. The beach lies at a slope and extends 15 m from the base of a granitic dome. A Lettonia Series, clay-loam occurs on the dome. The latter is characterized by a 31% sand content and a low (28.3%) liquid limit. The granite and clay-loam ridge rise 1 - 1.5 m above the beach vertically and then slope upward at a 10^{o} incline. The surface vegetation

is poplar and brush on the lower part of the slope with pine and white spruce toward the top. Further erosion of this site by wave action will be partially mollified by the granite ridge rising behind the beach. Where this ridge drops, erosion may occur to a maximum of 1 m.

The Beaver Site (EaKw-3)

The site is located on the north side of an east-facing peninsula on the east shore of Carter Island. Artifacts were recovered at the base of a high-rising granitic dome which supported an elevated bog. A faulted granitic slope, lying at a 5 - 10^{o} angle occurs above a series of sand and gravel catchment pools near the water edge. Stable but flooded soils were found behind the ridge where the bedrock supports a clay-loam to sandy clay-loam soil. Two soil profiles, one an Indian Bay type under pine, and the other a Whitemouth series soil (Smith and Ehrlich 1967) under oak and poplar, are adjacent to one another, and separated by a small granite ridge. These constitute Beaver Sites B and A respectively. Beaver Site C is an elevated gravel-sand beach heavily down-cut by wave action with a vertical gravel-sand wall 1 m high and a short 1 - 2 m granite beach with 5^{o} incline.

The liquid limit of the soil is low at the Beaver Site due to the high sand content. Deformation of the soils at A and B would be significant if they were directly exposed to wave action, but they are protected by the granite beach ridge. The soils will undeniably be flooded at a return to high water levels. Site C is already composed of an eroded gravel and sand beach and it will be altered considerably upon a return to high water -- probably to a steep sloping beach.

Eleanor Lake 4 (EaKw-5)

EL4 is a sand-clay peninsula on the southeast end of Carter Island. The beach rises sharply to .75 m above the lake on the east shore and declines gradually to the west. The east beach peninsula is narrow (1 - 3 m) at the point but widens at the north of the peninsula to 5 - 8 m. The west shore of the peninsula has a wide clay-silt beach (20 - 25 m) terminating at the base of a .75 m-high cliff. The cliff is undercut in places and fallen trees have pulled out portions of the bank, indicating direct wave action and collapse of the primary canopy. The surface vegetation of the eroding bank consist of oak and brush. The test unit soil sample indicates an Indian Bay Complex (Smith and Ehrlich 1969) common throughout the area. The beach is composed of a silty clay overlying a clay-loam. The bank soil is a silty clay similar to the beach surface with less sand (1%) and the concentration of silts in the lower part of the profile. The higher concentration of beach sand is an indicator of the degree of clay sorting from the beach area. The lower beach strata therefore have a higher (19%) sand content than the freshly sorted samples.

The liquid limit of the bank soil is 58.8% -- a reasonably high score on the liquid limit scale. The beach has a 5^{o} slope at the west end where most of the observable erosion has taken place probably due to the prevailing wind direction. Given the return to higher water levels and the exposure of the site to the prevailing winds, an additional 3 m of bank erosion at a rate of .6 m/year is projected.

Dorothy Lake 2 (EaKw-9)

Dorothy Lake 2 is located on one of the two large islands in the middle of Dorothy Lake. It is a high granite dome with varying thicknesses of soil and different soil types covering it. Vegetation ranges from oak brush forest to pine forest and grass cover. The west end of the island has a high bedrock beach (DL2 a) rising 1.5 m - 2 m above the 1981 water levels with catchment pools of sand clay silts and worn artifacts. The bedrock is faulted and weathered, and slopes at a 15^{o} incline for 2 - 3 m. The soil here is a clay-laom under oak-brush cover. The thin soil cover has eroded back to the extent that a return to normal operating levels will not disturb it further.

The south part of the island (DL2d) consists of a sandy loam cliff rising .75 m above a narrow 5^{o} sloped sand cobble beach 10 m in width. The site is under pine cover and contains a few artifacts. The site area is small (40 x 30 m) and held on the east and west by high granite ridges. Given the beach morphology of this part of the island the erosion rate is estimated at .3 m/year.

Dorothy Lake Narrows 2 (EaKw-19)

DLN2 consists of granite bedrock underlying a cobble and clay beach which rises to a low flooded terrace. Two tests on the terrace produced no artifacts. Artifacts were found at the south east end of the point near a shallow (.1 - .2 m) patch of soil. The profile indicates flooding with an organic rich horizon underlying a sandy grey clay diluvium. All pits at this site have this overburden.

The granite cobble and clay beach slopes down from the terrace at 5^{o} over 10 - 15 m. The terrace has been flooded for 100 m from the water's edge to the tree line. The area will be flooded upon the return to normal water levels. The deadwood and saw-grass cover form such a dense latticework at this site that further erosion from direct wave action will be limited. The immediate edge of the low (.2 m) terrace will be eroded for approximately 1 m.

Otter Falls 5 (EaKw-23)

The site occurs on a narrow beach of clay and silt leading up to a vertical cliff 1.5 m in height. The beach is nearly level with a vertical drop of 1 m to the water level. Surface vegetation on the beach is dense thistle and saw-grass, backed by a primary forest canopy of spruce and pine and a slight brush undergrowth. Considerably wave erosion and bank collapse seems to have taken place.

The soil from OF5 is 70% clay with a low sand content. The soil has a good liquid limit of 68.4% indicating it takes much saturation from water to cause this bank to collapse. The high, vertical clay beach limits the wave action that can break upon this site. The nature of the beach (vertical cliff) renders it difficult to estimate the extent of erosion at this site. The high clay embankments may limit the rate of erosion by the volume of sediments to be eroded from the vertical plain. The site, composed almost completely of soil, will eventually be completely eroded at an estimated .2 m/year. Given the size of the island this would take 200 years.

Otter Falls 7 a, b and c (EaKw-25)

OF7a is an oak meadow peninsula of shallow soil deposition over a west-sloping faulted granite bed. Soil is a deeply weathered organic rich clay with a thin gleyed C horizon near the bedrock where drainage is irregular. The vegetation is a sparse oak stand with open meadow grass at the south point of the peninsula with increasingly thick brush cover towards the north. The brush line extends along the entire west face. The east side of the site is clear of brush near the beach, but undergrowth becomes considerably thicker to the north. The east beach (5 m wide) is composed of granite bedrock and sand and gravel and is characterized by a 10 to 20^{o} slope. A granitic dome falls off to the west at about 5^{o} for a length of 3 m and terminates in a vertical drop of .75 m at the waters edge. The grass cover in the east is dense and has retarded erosion from waves due to the extent of the root structure. Lichen on the trees is raised .5 m above the forest floor and may indicate a temporary flood, but if this is the case, it has not damaged the oak forest to any visible extent, at least inasfar as this is discernible in the terrace profiles. An estimated 2 m of erosion will take place here at a rate of .17 m/year given the nearshore morphology of reconstructed past erosional patterns.

OF7b extends as a sand beach west of OF7a. There is an eroded and unclear bank at this site backed by a flood-affected forest denoted by saw-grass, thistle, a water killed canopy and partially killed second storey cover (5 - 8 year old elms). The overgrown bank has reached a stable structure. Test pits behind the beach show a flooded but stable profile with a thick LFH, 2 - 4 cm Ah, and a B horizon to the pit base

of 25 cm. Flooding is indicated by slight discoloration in the B horizon.

OF7c occurs on thin soil over a rock outcrop with a dense grass root mat to the north of OF7b. Further north the profiles become deeper. The rock outcrop is high (3 m) above present lake levels and slopes down ot it at 30^{o}. There is no visible sign of erosion here. Samples from this site indicate a clay soil with a moderate-to-good liquid limit (55.8%). This site will not be eroded by a rise in lake level.

Otter Falls Rapids North (EaKw-27)

OFRN is a south-facing peninsula bisected by a rasied granite ridge overlain by a 40 cm deep soil horizon which runs in an east-west direction across the site. This deep horizon contains the highest concentration of artifacts. The west beach is 5 - 8 m wide running the length of the site for 200 m. The beach leads up to a low eroded terrace (.2 m high) that has significant flood killed and pioneering vegetation in evidence to a distance of 10 m from the terrace edge. Further back there is an oak-poplar forest with brush growing to the north and south. The site slopes down to the south and it is possible that the southern end has been flooded since there is evidence of water killed trees for 50 - 70 m from the shore here and the soil cover is thinner over a boulder base making profile determination difficult if not impossible. In the northern half of the site, coniferous species gradually increase in frequency. Further north still, the site drops down to form a flooded and eroded intrusion near the north limit of the tested area. Here, saw-grass and a heavy flood-clay are present. The soil in the site area (on the ridge) is a sandy loam over weathered granitic bedrock. The soil is shallow

and shows no evidence of sorting over this faulted boulder base. The soil is probably of fluvial origin deposited under periglacial conditions (Brady 1974:299). The bank face is heavily covered by dense pioneering vegetation and will likely be extensively flooded. Erosion by direct breaking wave action will be limited because the water will rise above the level of the bank upon a return to normal operating conditions at Seven Sisters. The shallowness of the beach and its support of a dense swamp vegetation are expected to limit the action of wave erosion at this site.

Otter Island West End (EaKw-29)

At the west end of Otter Island a clay bank rises 1 - 2.5 m vertically above a 15° sloped bedrock base and catchment beach. The distance from cliff to shoreline is 5 - 8 m. Soils are of an Indian Bay Complex (Smith and Ehrlich 1967) silty clay loam type under a pine forest cover. Deposits are loose and powdery under a heavily rooted surface. Extreme erosion has occurred at this site and both the bank and forest cover have recently collapsed. An estimated two meters of future erosion will take place at this site upon resumption of normal operating levels. Rates of erosion are hard to estimate given the lack of beach detail, but the volume of sediments to be eroded may have some affect on the erosion rate at this site.

Margaret Lake 2 (EaKw-30)

ML2 is a small island off the major east-facing peninsula of Carter Island. The site tested was above the beach at ML2b. The site

consists of a bedrock-catchment beach .5 - .75 m above the current water levels. The bedrock beach is sloping and faulted down to the water level at about 15° and extends 10 m from water line to cliff base. A test unit was placed on the top of a cliff that forms part of the point at the northeast end of the island. The cliff runs from .4 - 1.5 m above the beach depending on the slope of the bedrock. Soils from the pit were typical of the Indian Bay Complex (Smith and Ehrlich 1967) with heavy vegetation and dense root structure. Soil was loose in the Ah zone and easily friable in the C horizon. Surface vegetation was dense with cranberry, rosehip, and raspberry bushes occurring under an oak canopy. Particle size analysis indicates a clay and silty clay with the concentration of silt in the lower C horizon. This site is reasonably high above the lake level and using Dubois' erosion model, no further erosion by wave action will take place at this high site.

Dorothy Lake 12 (EaKw-32)

DL12 is located on the south side of an east facing peninsula on the north side of Dorothy Lake. The site consists of a 10 m-wide sand beach over clay rising to a flood affected terrace. The terrace bears a stand of saw-grass which extends as far inland as 40 m, thus indicating that the area has been extensively flooded. The terrace rises between .5 m and 5 m above the beach. The flood affected terrace has a 53% clay content and would be expected to have a lower erosion rate due to wave action as compared to sites with sandier soils. The site is flooded at normal operating levels (evidenced by the saw-grass) and no breaking waves act upon a vertical cliff here. The present beach was probably formed in the

reservoir's earlier history. The current state of the site will be relatively unchanged by a return to normal operating levels.

Sylvia Lake 3 (EaKx-23)

This site is located on the northwest side of Carter Island in a bay immediately east of Porcupine Island. The northern locus of the site (SL3N), lies on a low granite point. The main area of concern, however, was the southern locus, SL3S. The latter has a .75 m vertical clay terrace beach 10 m in width. At the back of the beach, a vertical cliff bank rises 1 - 1.5 m at the north. The bank meets the terrace-shore 70 - 80 m to the east and then rises 1 - 1.5 m in a vertical cliff at the back of the bay. There is an oak forest cover at the northwest part of the bay and a pine forest cover at the southeast end of the bay. The two areas are separated by a bog-like depression where the vertical banks taper down to the terrace and form a grass and young poplar stand.

The clay terrace beach remains of fairly constant width around the bay. The kind of bank erosion visible here is vertical slumping and supplementary wave sortment of clay particles -- hence the near horizontal terrace beach. If the beach width is taken as an indicator of erosion, then the rate is approximately .33 m/year. Given the nature of the site (clay), it is resonable to expect complete erosion of the site at normal reservoir levels. The liquid limit of the clay and silty clay sample is 65.7%, constituting a higher moisture content reading before liquid deformation occurs.

Crater Lake 3 (EaKx-31)

CL3 is on the north bank of the most northerly channel of the Winnipeg River around Channel (Hind) Island. There is an inclined bedrock beach extending 10 m at a 10^{o} slope away from the site. Little to no clay bank has been formed here as the bedrock rises to the edge of the soil and then drops off forming a container-basin. The beach bears a number of pooled clay catchments and supports a pioneering saw-grass vegetation cover. The upper soil is a black chernozem (Brady 1974:317) with a flooded B horizon (Shaykewich et al: 18) which supports meadow grasses, oaks and brush.

The soil may be considered a silt loam. Correspondingly, the site has a low liquid limit (25.9%) in comparison with other sites. The site will be flooded upon the return to normal operating levels, judging from the inclination of the beach and the expected rise in water levels. The kind of erosion that will take place is unknown since wave action is limited by the narrow channel, and the bedrock beach. The beach will probably be flooded but the upper terrace may remain intact.

The Margaret Lake Site (EaKx-17)

The Margaret Lake site consists of a granitic dome island with sand and gravel catchments near the water's edge and silt loam under sparse oak cover on the higher, more stable areas. Buchner (pers. comm. 1981) noted significant site disturbance of recent origin in the course of the 1975 test excavations, but the one test conducted in 1981 indicated a stable profile. It seems possible that the disturbance may be localized.

The beach slopes at 15° for 5 m from the bank to the water level. The site is about 1.5 m above the present water level and has been flooded in the past but never for a sufficiently extended period of time to cause significant erosion beyond the beach slope. The site is bound at the back by a high granitic cliff and in fact has little surface area to it (approximately 30 x 10 m). It is similar in nature to the Beaver site and protected in much the same way; a rising granite ridge protects the soil cover. The western edge of the site is the highest above the ridge (.3 m) so erosion may cut another 2 m of the site. A visual record of continuous erosion in the form of a sand or clay beach is not present here. What deposits were noted had been washed away long ago. The estimated beach recession based on the original river edge is approximately 20 m at a recession of 1.5 m/year. This may be expected to continue on the small western edge of the site.

Sturgeon Falls (EaKv-2)

Sturgeon Falls is on the east shore of Nutimik Lake and is bounded on the north by a high clay bank which overlies a high (1.5 - 2.5 m) granitic promentory. To the south, an unsorted till ridge marks the limit of the site. The site has a wide (35 - 40 m) sand beach with increasing clay content at the north end. In 1979, the beach was 5 - 10 m wide and wave action was visible within 1 m of the cliff base near the centre of the site. The cliff is 3 - 4 m high at the north end dropping to 1 m in the middle and rising to 9 m at the till feature. The estimated past rate of erosion is 1 m/year. The bank has reached the degree of horizontal recession necessary to stabilize at this point under normal operating conditions.

It is still susceptible to spring flood erosion. The till feature is in the wave zone but has formed a dense talus of boulders from previous erosion and these now act as a significant wave barrier.

Cemetery Point (EaKv-1)

This site, initially excavated by MacNeish (1958) was subsequently reinvestigated by Buchner (1980a) in 1979, and information about its pedological origins are included in Nielsen's appendix to that report. The site consists of a high sand bank (6 m high at the northeast end) grading down to a vertical clay bank (3 m high) at the southwest tip of the intact portion of the site. There is a wide (40 m) beach which lies at a 15^{o} slope before flattening out to a 3^{o} slope at the water's edge. In the spring of 1979 the water line was 5 - 8 m from the cliff with wave action visible within 4 m of the cliff base. Partical size breakdown (Daly n.d.) shows a sand to sandy clay loam content. Given the observed amount of erosion estimated to have occurred over 6 years (Buchner, pers. comm.) and the estimated erosion for the past 30 years, an erosion rate of .8 m/year is obtained.

SUMMARY AND CONCLUSIONS

It is difficult to estimate the past and present rates of erosion at those sites where no clear beach formation exists. These sites are generally characterized by short, steep granitic beaches, often overlain by coarse-grained sands or silts. Frequently, wave action has completely washed the soil from the slope. In the two cases where coarse grained beaches exist with good evidence of long term formation (Sturgeon Falls and

TABLE 4

Erosion Indices for Sampled Sites

BORDEN NO.	LIQUID LIMIT	EROSION	SOIL TYPE	SITE SIGNIFICANCE
EbKw-11		Extensive	Sand	D
EaKv-1		Extensive	Sand	B
EaKv-2		Extensive	Sandy clay	B
EaKw-27		Moderate	Sandy loam	C
EaKw-9		Extensive	Sandy loam	C
EaKw-3	28	Moderate	Sandy clay loam	C
EaKw-19		Extensive	Sandy clay loam	D
EaKx-17		Extensive	Silt loam	C
EaKx-31	25.9	Moderate	Silt loam	C
EaKw-29	29.7	Extensive	Silty clay loam	B
EbKw-18	28.3	Moderate	Clay loam	C
EbKw-13	34.6	Extensive	Clay loam	D
EbKw-12	38.6	Extensive	Clay loam	D
EbKw-11		Extensive	Clay loam	D
EaKw-3		Moderate	Clay loam	C
EaKw-30	43.6	Moderate	Silty clay	C
EaKw-5	58.5	Extensive	Silty clay	C
EaKw-25a		Moderate	Clay	B
c	55.8	Moderate	Clay	D
EaKv-31	62.4	Minimal	Clay	C
EaKx-23	65.7	Extensive	Clay	B
EaKw-23	68.4	Extensive	Clay	D
EaKw-32		Extensive	Clay	D

Cemetery Point), the greatest rates of erosion given the volume (vertical height of a bank over a given horizontal distance) of sediments has occurred. These two sites are at the east end of the reservoir and hence are least subject to reservoir fluctuation. Coarse grained beaches tend to be rather wide and gently sloping. Again Sturgeon Falls and Cemetery Point serve as examples. Finer clay particles, on the other hand, occur on gently sloping or near flat beaches. The latter tend to be narrow with evidence of vertical collapse at the water's edge (OF5, SL3). Very often high clay embankments, 3 - 5 m above the water level, are in evidence at these sites. In contrast, lower clay embankments have a sloping beach of 5^{o} or less. Where no beaches occur, the site margin is characterized by vertical clay cliffs over granite bedrock. The north part of Sturgeon Falls and the west end of Otter Island bear witness to this particular variety of erosion. Both sites on high collapsing sand banks, as well as those situated in low-lying basin-shaped depressions (Margaret Lake, Beaver) may be composed of silt loam, loam, or sandy clay loam. Shallow sandy loam sites such as DL2d have soil rapidly eroding by wave action. Because the deposits are shallow, the root structure of the forest cover penetrates to the bedrock or boulder base thus resisting erosion.

Table 4 indicates the liquid limits, amount of erosion, and the soil type for sampled sites within Research Area No. 2. It will be noted that the moisture (% water) content expressed as the liquid limit (the limit at which a fine grained sample will behave in a "liquid" fashion) increases in proportion to the clay content. Judging from the observed shape of the river banks, extensive erosion has occurred at almost all sites. This is a result of the higher water levels brought about by the

creation of the reservoir. Generally, rates of erosion tend to indicate that coarser grained, sandier sites erode more quickly than sites with a high clay content. An example of this would be the .33 m/year estimate for SL3 compared to the .8 m/year estimate for Cemetery Point.

The final column in Table 4 plots the "significance" of the 23 loci against past and projected susceptibility to natural erosive agencies. The indicated ratings are derived from Tables 1 and 2 and are explained therein.

Four of the five sites which have been assigned the highest degree of significance are characterized by extensive past erosion and considerable anticipated destruction. This correlation is not simply a result of the higher degree of visibility of cultural remains at highly eroded stations. The extensive testing of stable, minimally eroded sites indicates that the correlation is real and not an artifact of the sampling procedure.

Clearly, one attribute of a "good" campsite is rapid drainage and this situation would obtain at sites composed of coarse-grained deposits of silt or sand. As these kinds of deposits are most prone to rapid erosion, then almost by definition, prehistoric dwelling sites tend to erode more quickly and more completely than unoccupied localities. Poorly-drained, less erodable areas were undeniably utilized by prehistoric peoples from time to time, but the activities associated with them seem to have been of a transient, resource extractive nature. Living areas per se appear to have been situated in more erosionally vulnerable positions. This unfortunate situation only lends greater urgency to the management

and preservation of our archaeological resources. It is hoped that this study has in addition to highlighting the problem, also yielded some insights into the development of techniques geared towards the protection of sites from natural erosional forces.

THE ARTIFACTS

Plate 8

EcLa-5

a,b projectile points
c-l scrapers
m-r bifaces

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
5 cm

Plate 9

EcLa-5

a projectile point
b-d scrapers
e biface
f-h projectile points
i spokeshave/scraper
j biface
k,l celt fragments
m chopper

EcKx-5

n-p projectile points
q biface blade

EcKx-6

r-v projectile points

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
5 cm

Plate 10

EcKx-6

a-d projectile points
e-k bifaces
l-r scrapers
s rimsherd

EcKx-7

t projectile point

EcKx-11

u rimsherd

EcKx-12

v-y projectile points
z-aa scrapers

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
z
aa
5 cm

Plate 11

EcKx-13

a-c projectile points
d-f scrapers
g unifacial flake knife
h rimsherd

EcKx-18

i-k projectile points
l scraper
m chopper

EcKx-20

n-p projectile points
q-t scrapers
u-y rimsherds

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
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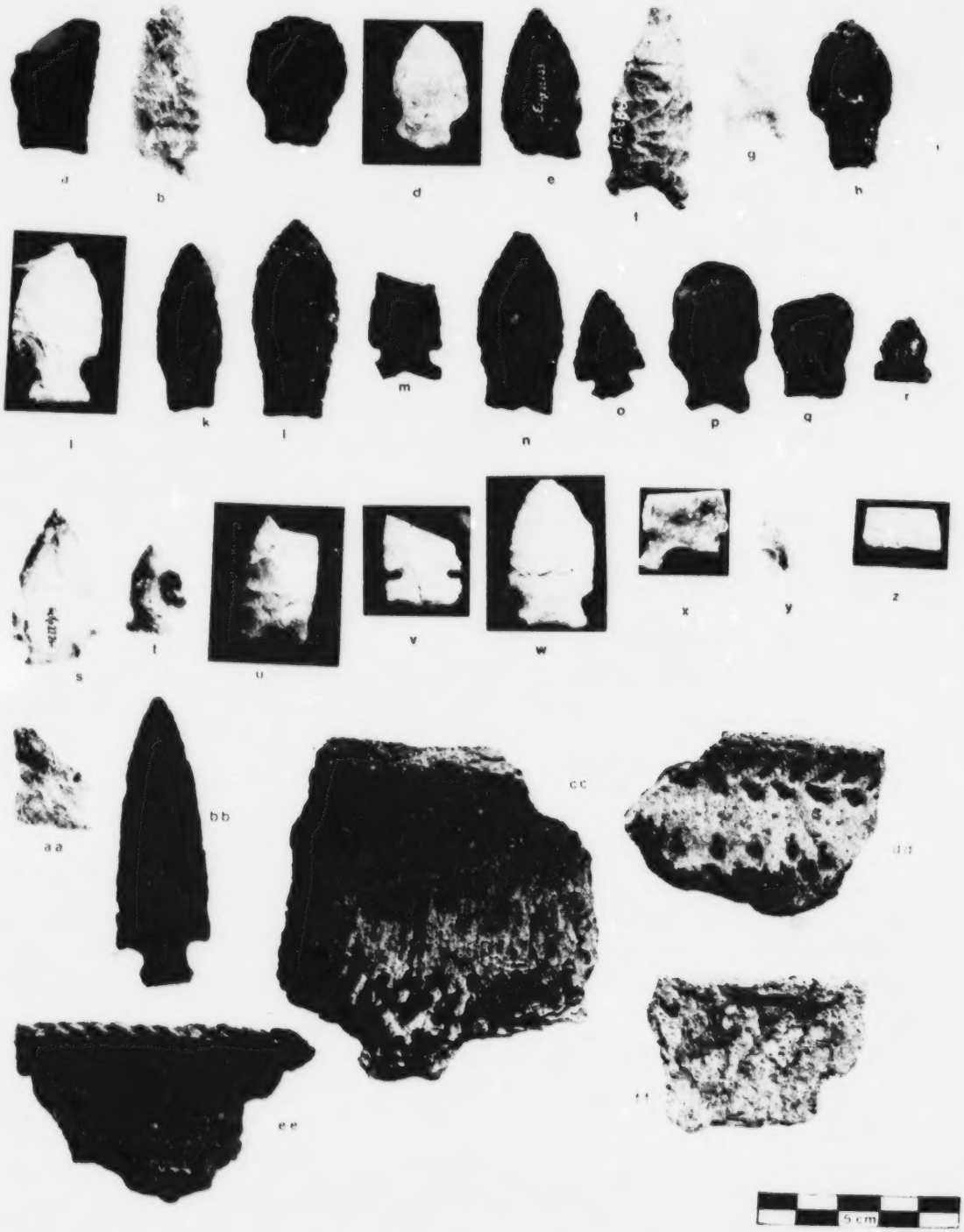
u
v
w
x
y
5 cm

Plate 12

EcKx-22

a-bb projectile points
cc-ff rimsherds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x
y
z
aa
bb
cc
dd
ee
ff
5 cm

Plate 13

EcKx-22

a-j scrapers
k-m projectile points
n-q scrapers
r-t bifaces
u,v rimsherds
w ceramic figurine

EcKx-24

x,y projectile points
z biface blade

a
b
c
d
e
f
g
h
i
j
k
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v
w
x
y
z
5 cm

Plate 14

EcKx-24

a-c projectile points
d-h scrapers
i,j bifaces
k rimsherd

EcKx-26

1 celt

EaKv-1

m,n bifaces
o adze
p-r scrapers

a
b
c
d
e
f
g
h
i
j
k
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q
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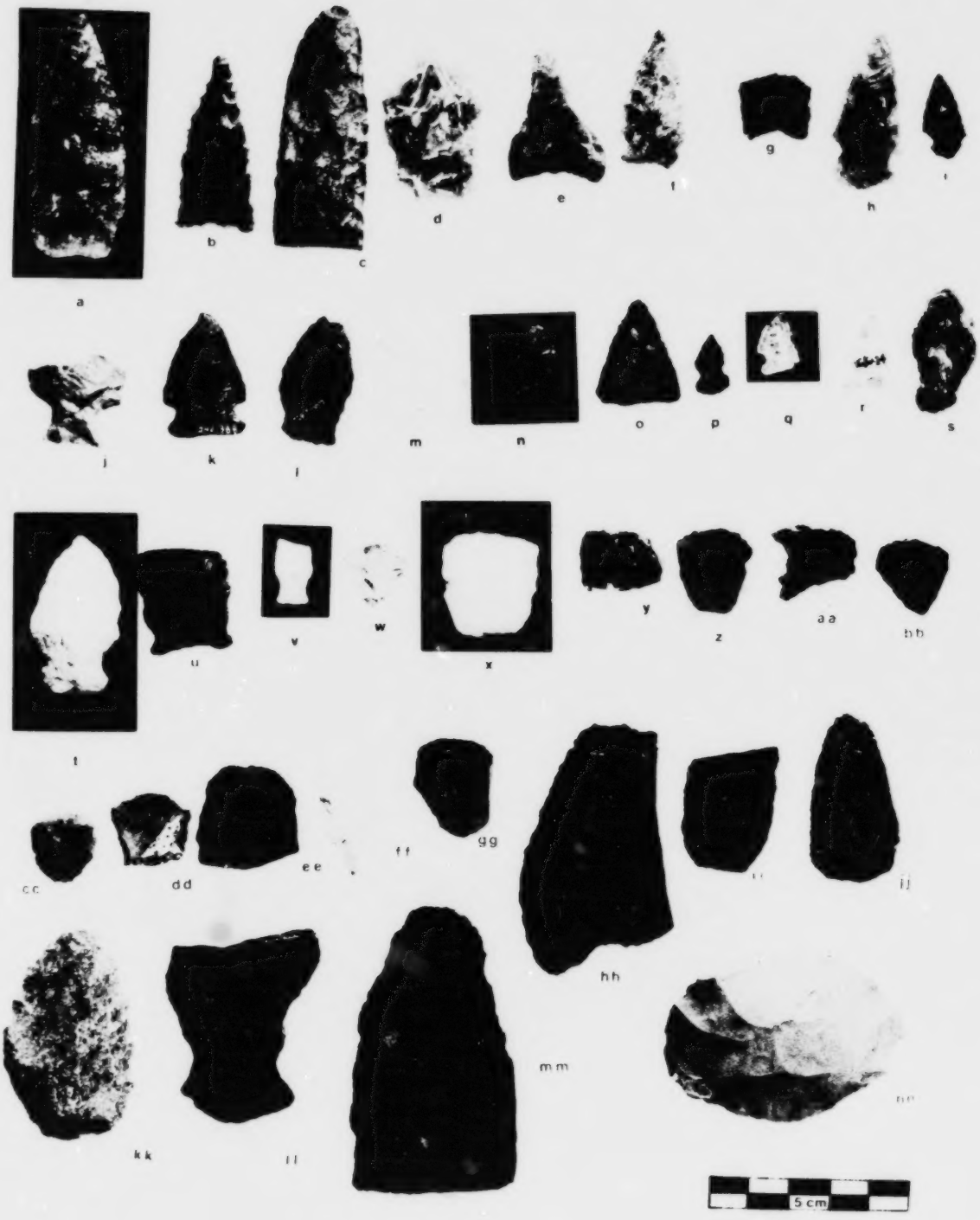
cm

Plate 15

EaKv-2

a-v projectile points
w-ii scrapers
jj-nn bifaces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ii
jj
kk
ll
mm
nn
5 cm

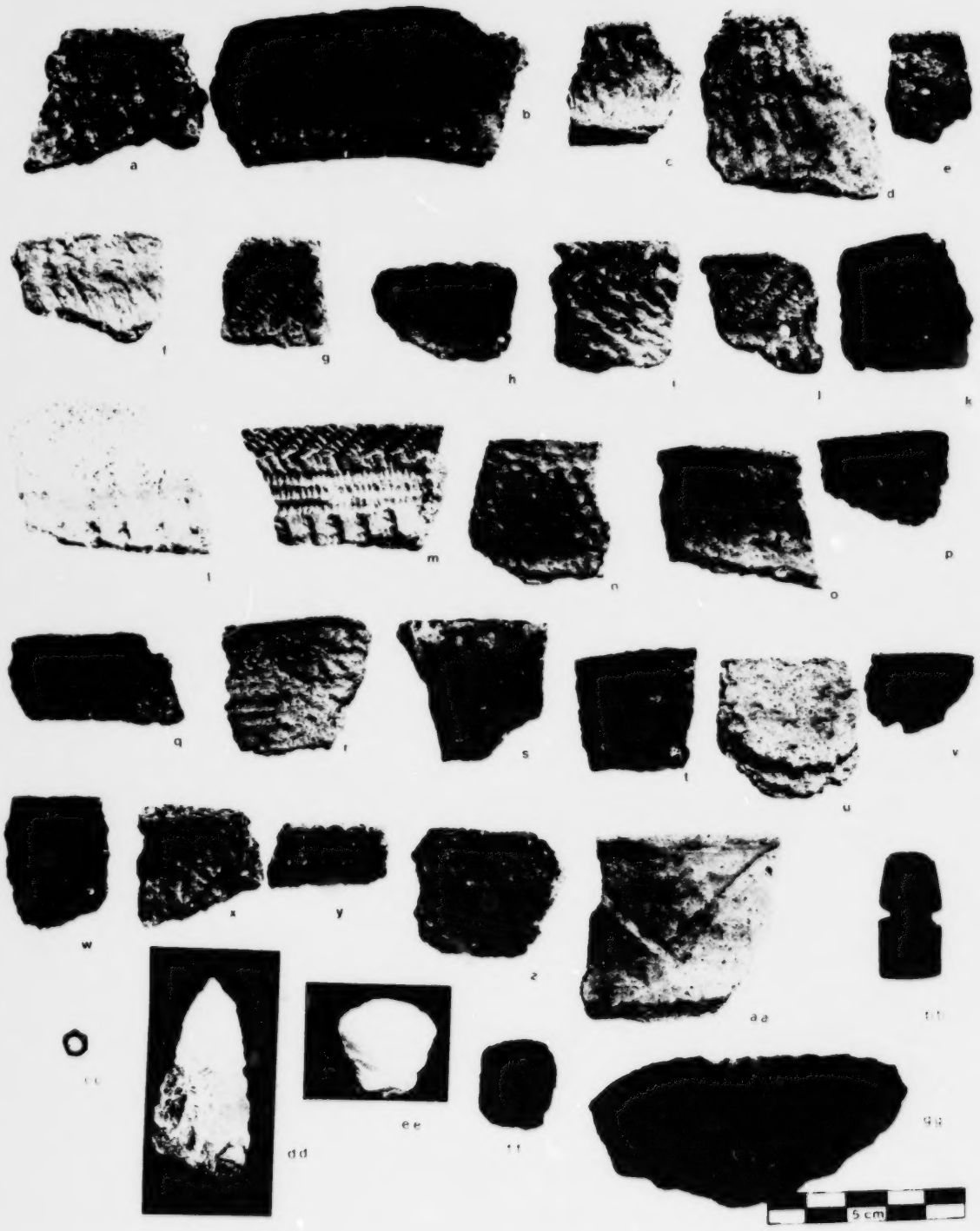
Plate 16

EaKv-2

a-aa rimsherds
bb steatite pipe
cc glass bead

EaKv-30

dd biface
ee,ff scrapers
gg unifacial knife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y
z
aa
bb
cc
dd
ee
ff
gg
5 cm

Plate 17

EaKv-31

a-j projectile points
k-r scrapers
s biface
t-bb rimsherds

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
z
aa
bb
5 cm

Plate 18

EaKv-31

a-o rimsherds

EaKv-32

p projectile point

EbKw-4

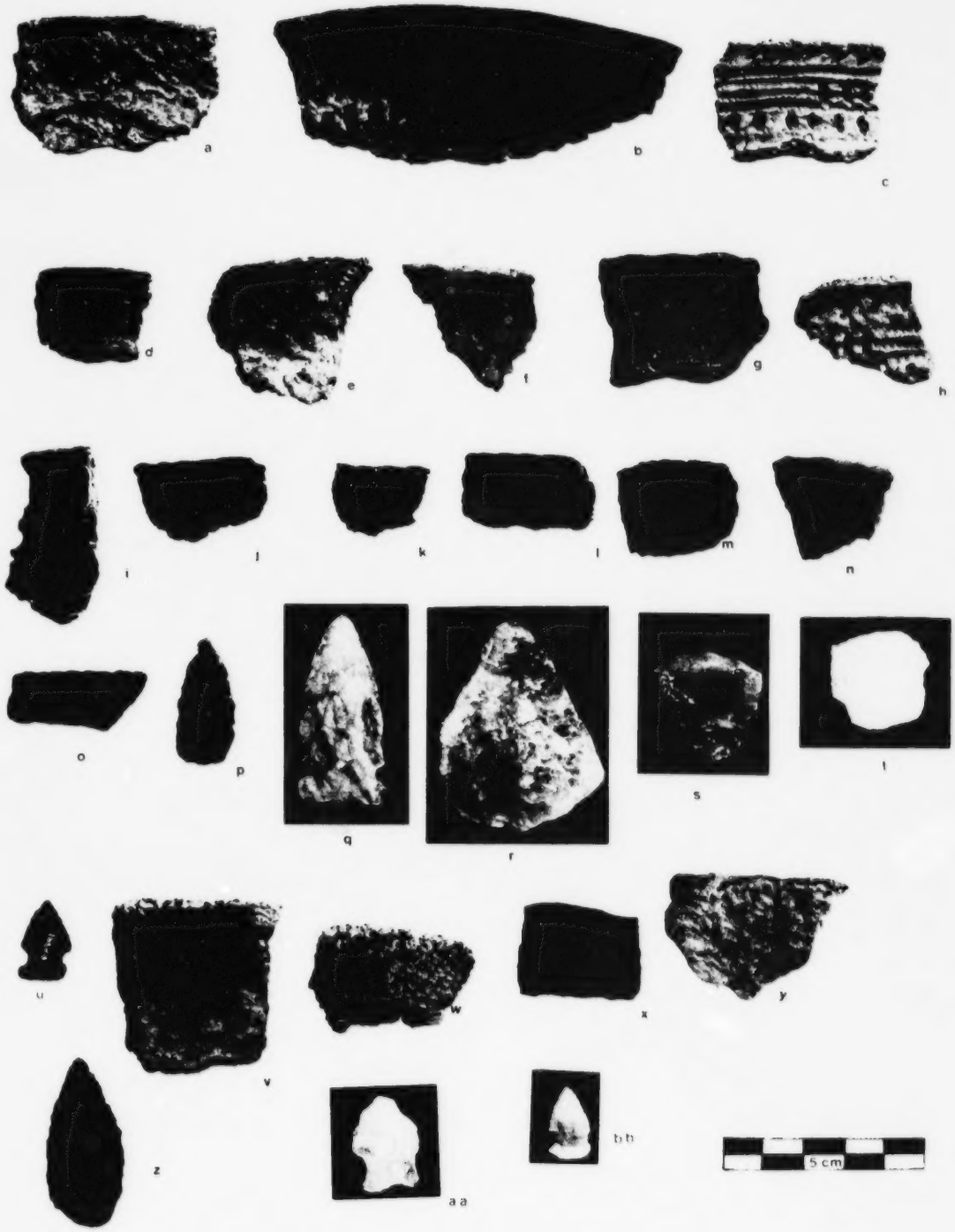
q projectile point
r-t scrapers
u projectile point
v,w rimsherds

EbKw-6

x biface base

EbKw-8

y rimsherd
z biface
aa,bb projectile points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x
y
z
aa
bb
5 cm

Plate 19

EaKw-2

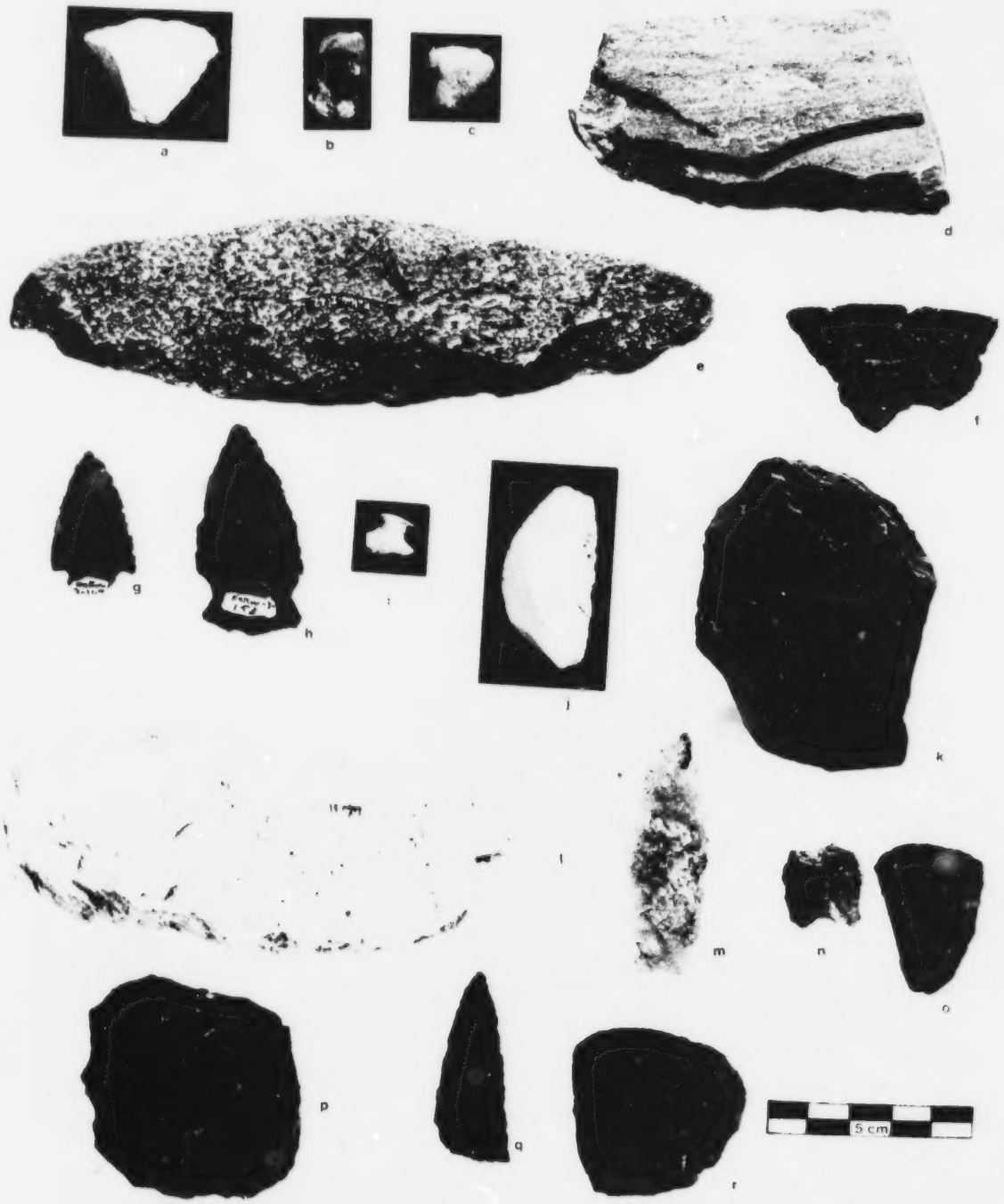
a-c scrapers
d,e knives

EaKw-3

f rimsherd
g-i projectile points
j,k scrapers
l scraper plane

EaKw-4

m,n projectile points
o,p scrapers
q biface fragment
r knife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p
q
r
5 cm

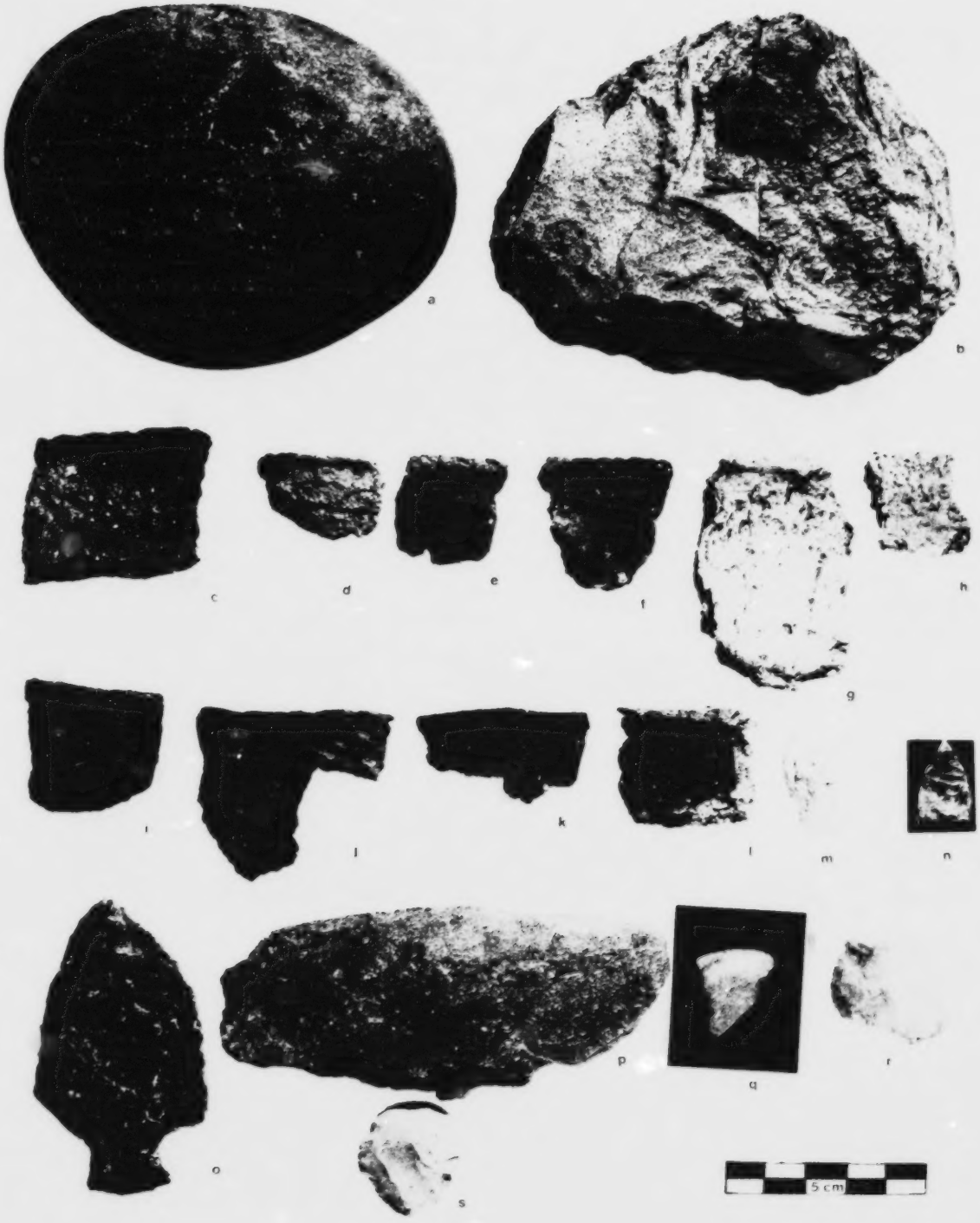
Plate 20

EaKw-4

a grinding stone
b scraper plane

EaKw-5

c-l rimsherds
m,n projectile points
o,p knives
q-s scrapers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s
5 cm

Plate 21

EaKw-6

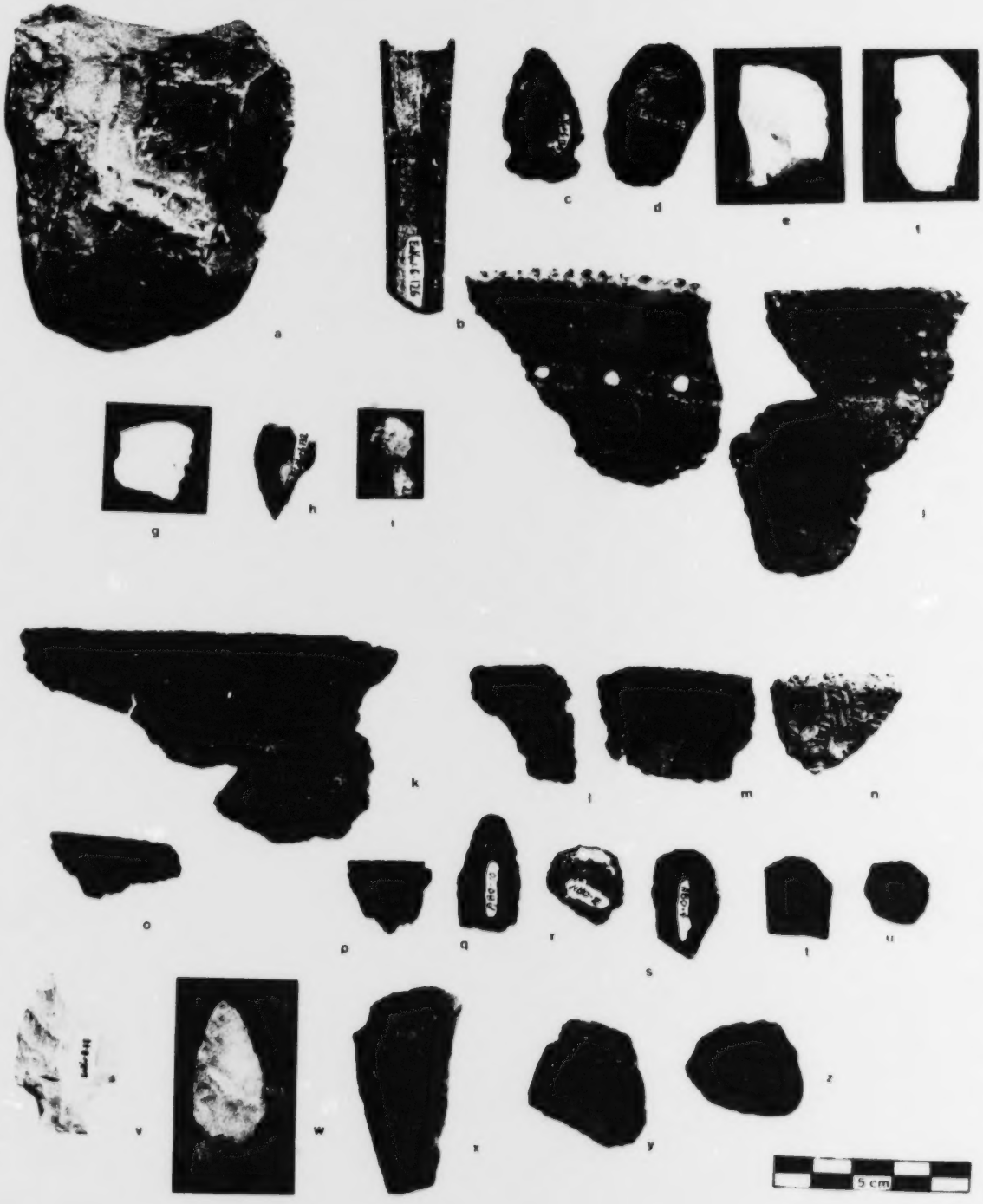
a chopper
b steatite pipe
c projectile point
d-i scrapers
j-p rimsherds

EaKw-7

q biface
r-u scrapers

EaKw-8 (a)

v,w projectile points
x-z scrapers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x
y
z
5 cm

Plate 22

EaKw-8 (a)

a,b scrapers
c,d bifaces
e-h rimsherds

EaKw-8 (b)

i scraper
j biface
k scraper
l rimsherd

EaKw-9 (a)

m,n projectile points

EaKw-9 (b)

o-q projectile points
r steatite pipe
s,t rimsherds

EaKw-9 (c)

u rimsherd

EaKw-9 (d)

v projectile point
w steatite pipe
x,y rimsherds

a
b
c
d
e
f
g
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i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
5 cm

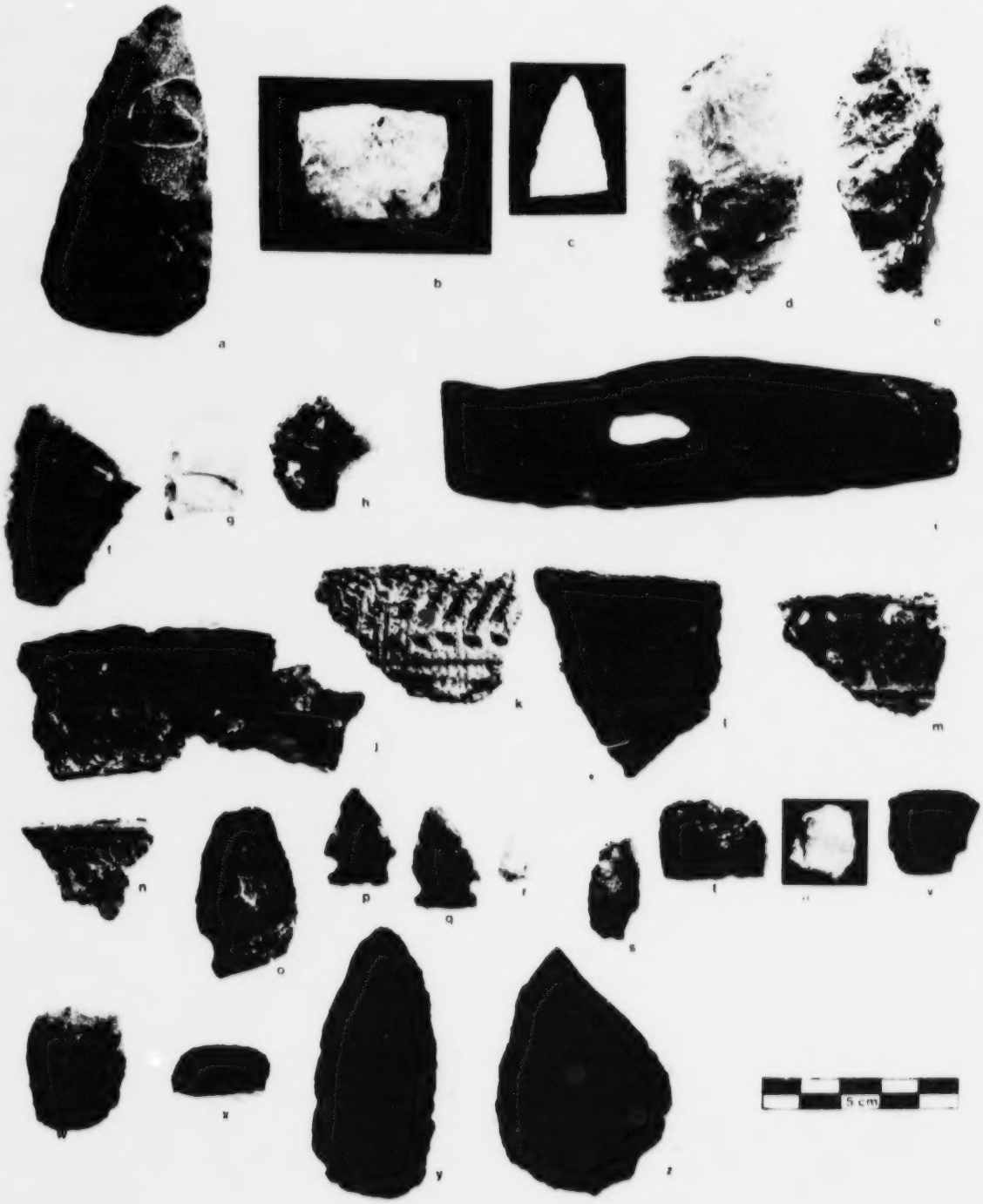
Plate 23

EaKw-14

a-e bifaces
f flake knife
g,h scrapers
i ground stone--possibly an awl sharpener

EaKw-15

j-n rimsherds
o-s projectile points
t-x scrapers
y,z bifaces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x
y
z
5 cm

Plate 24

EaKw-15

a chopper

EaKw-17

b celt
c projectile point
d-f scrapers

EaKw-19

g rimsherd

EaKw-20

h projectile point

EaKw-21

i projectile point
j biface fragment
k rimsherd

EaKw-22 (b)

l end scraper on a blade
m biface
n projectile point

EaKw-23

o biface fragment

EaKw-24

p,q rimsherds
r scraper
s biface

5 cm

Plate 25

EaKw-25 (a)

a-hh rimsherds

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
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s
t
u
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aa
bb
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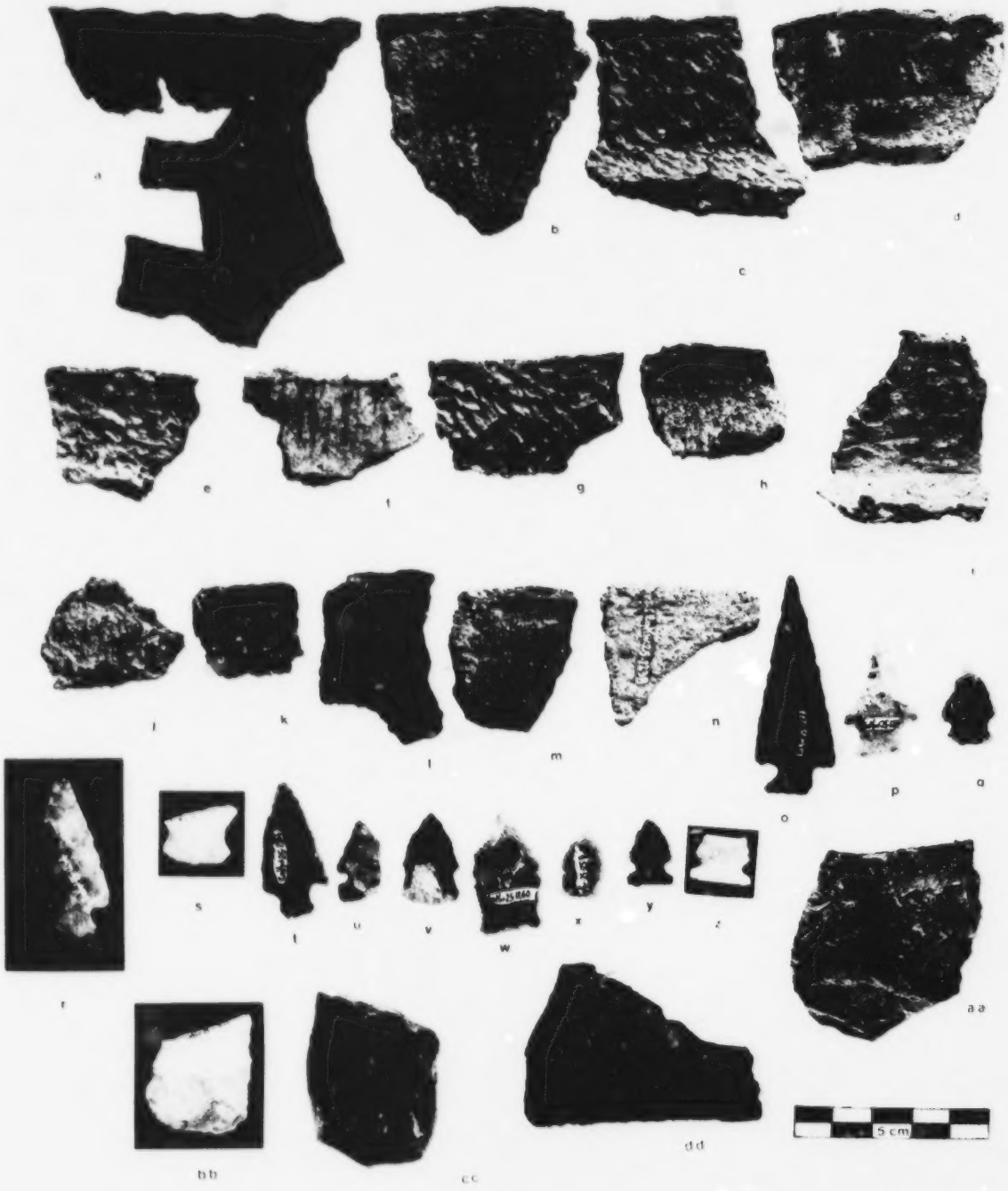
5 cm

Plate 26

EaKw-25 (a)

a-n rimsherds
o-z projectile points
aa,bb bifaces
cc,dd scrapers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y
z
aa
bb
cc
dd
5 cm

Plate 27

EaKw-25 (a)

a-o scrapers
p chopper
q steatite pipe
r kaolin pipe

EaKw-25 (b)

s-bb rimsherds

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
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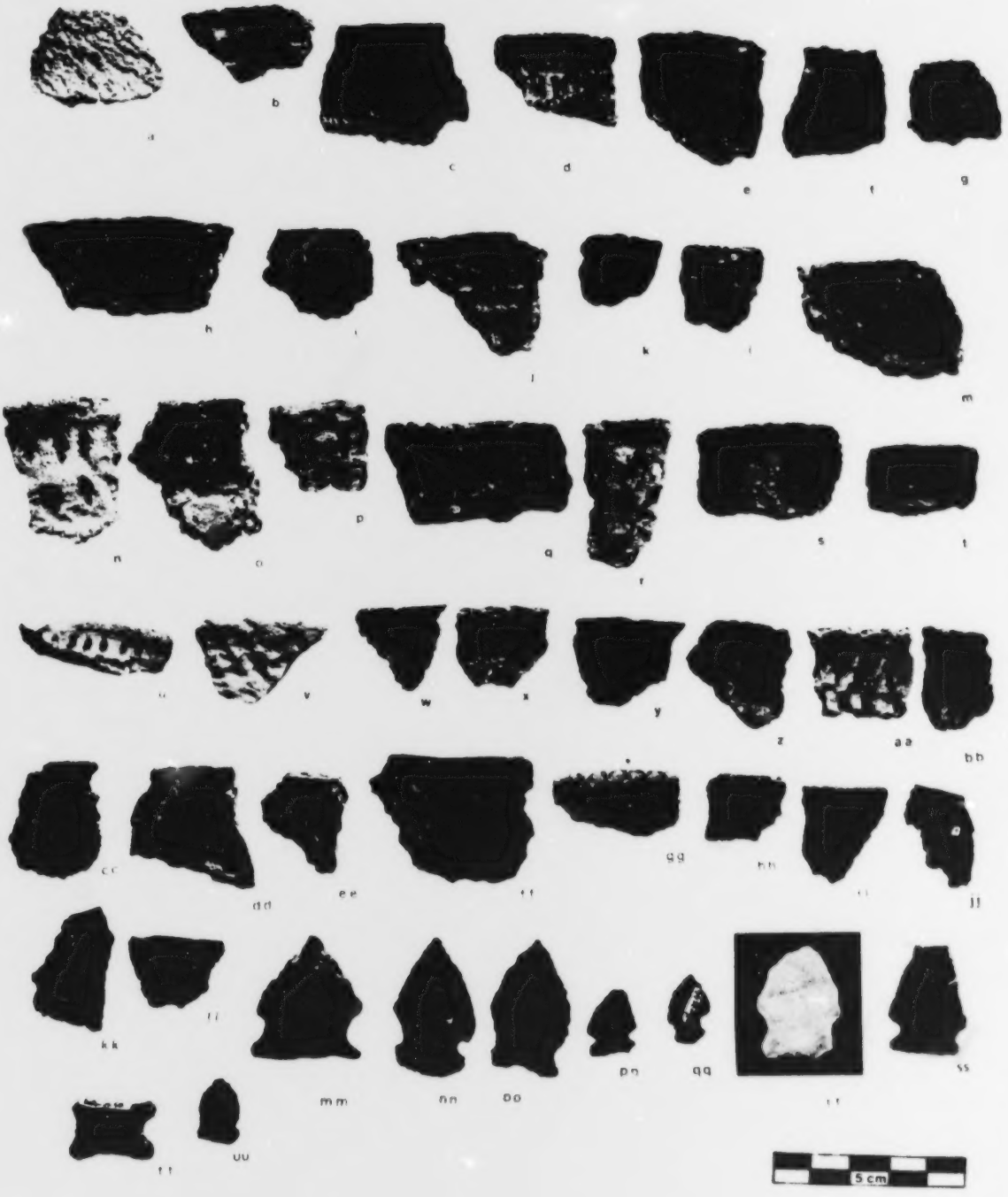
x
y
z
aa
bb
5 cm

Plate 28

EaKw-25 (b)

a-ll rimsherds
mm-uu projectile points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aa
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ii
jj
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ll
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uu
5 cm

Plate 29

EaKw-25 (b)

a-f projectile points
g-w scrapers
x-z bifaces
aa copper awl
bb knife
cc steatite pipe
dd polished gouge

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
z
aa
5 cm

Plate 30

EaKw-25 (b)

a polished stone
b celt

EaKw-25 (c)

c projectile point

EaKw-26

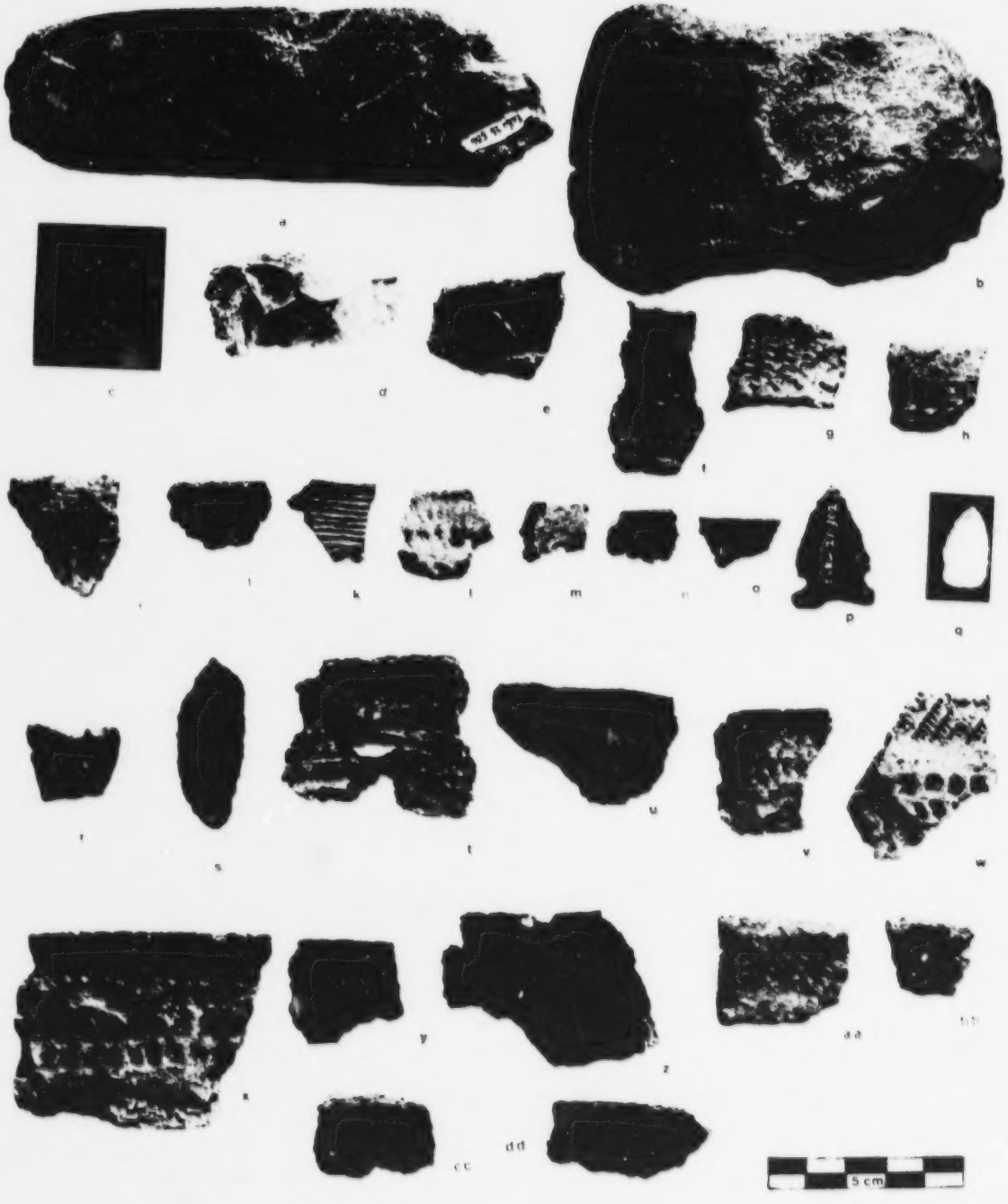
d scraper

EaKw-27

e-o rimsherds
p,q projectile points
r scraper
s biface

EaKw-28

t-dd rimsherds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w
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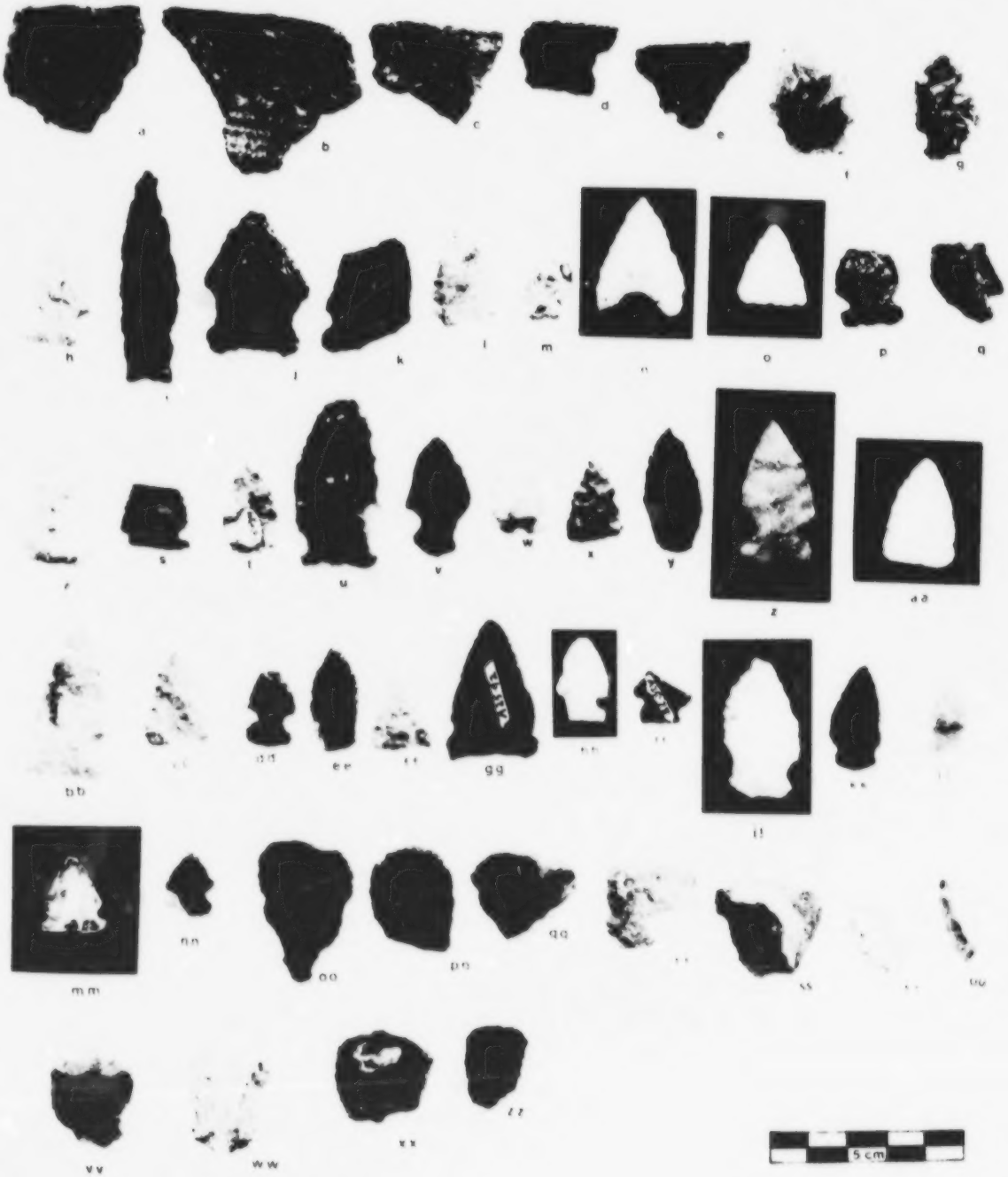
aa
bb
cc
dd
5 cm

Plate 31

EaKw-28

a-e rimsherds
f-nn projectile points
oo-zz scrapers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vv
ww
xx
yy
5 cm

Plate 32

EaKw-28

a-c scrapers
d scraper plane
e-p bifaces
q polished hammerstone
r drill fragment
s steatite pipe
t,u gunflints

5 cm

Plate 33

EaKw-29 (N)

a rimsherd

EaKw-29 (S)

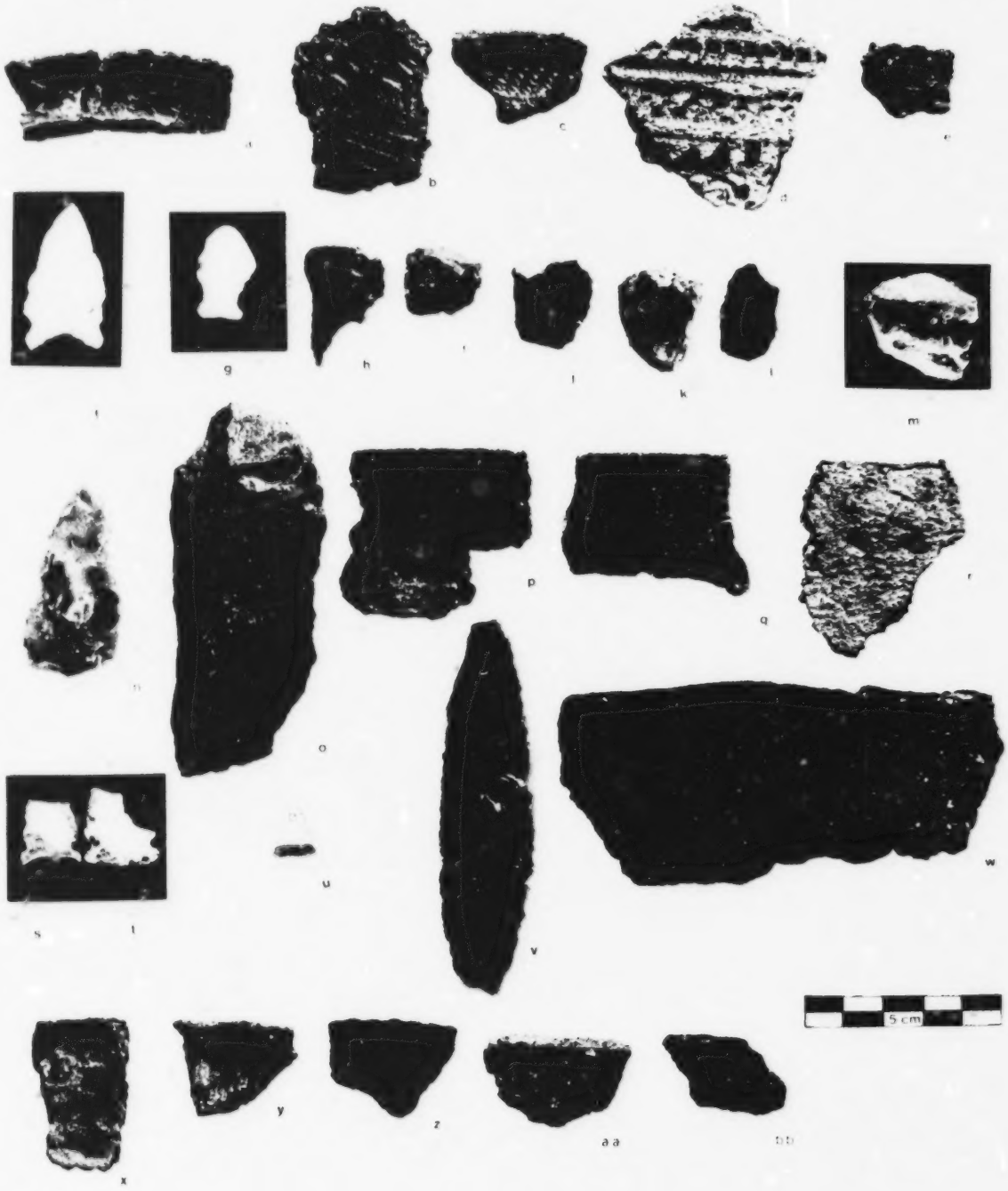
b-e rimsherds
f,g projectile points
h-m scrapers
n,o bifaces

EaKw-29 (W)

p-r rimsherds
s,t projectile points
u glass pendant
v biface

EaKw-29 (E)

w-bb rimsherds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v
w
x
y
z
aa
bb
5 cm

Plate 34

EaKw-29 (E)

a-c rimsherds
d-jj projectile points
kk-ww scrapers

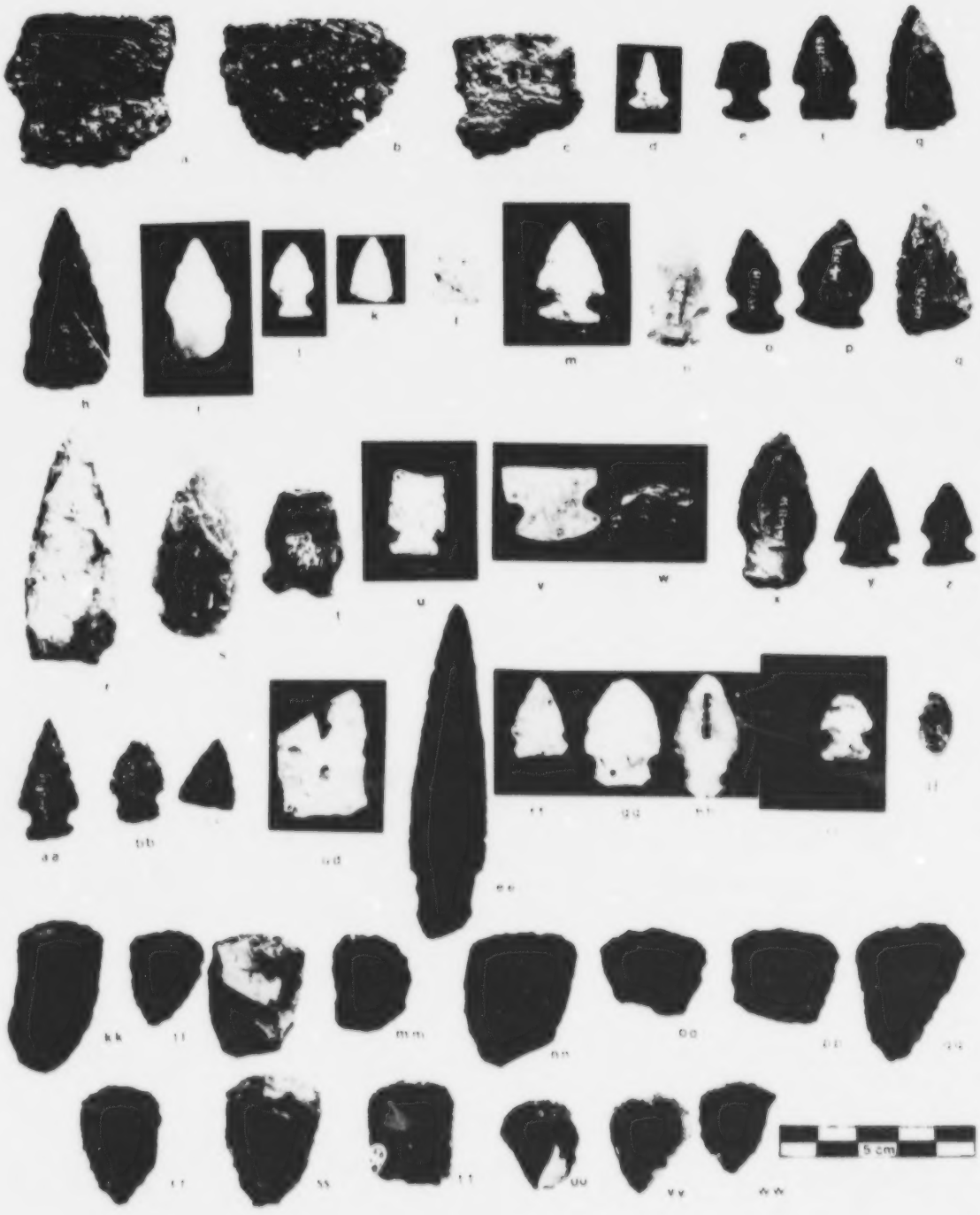

5 cm

Plate 35

EaKw-29 (E)

a-i scrapers
j-s bifaces
t-v celts
w drill
x kaolin pipe stem

5 cm

Plate 36

EaKw-30 (a)

a-c rimsherds
d,e projectile points

EaKw-30 (b)

f projectile point

EaKw-32

g biface

EaKw-33

h biface

EaKw-34

i copper cone

EaKx-2

j rimsherd
k-s projectile points
t-v scrapers
w chopper
x biface

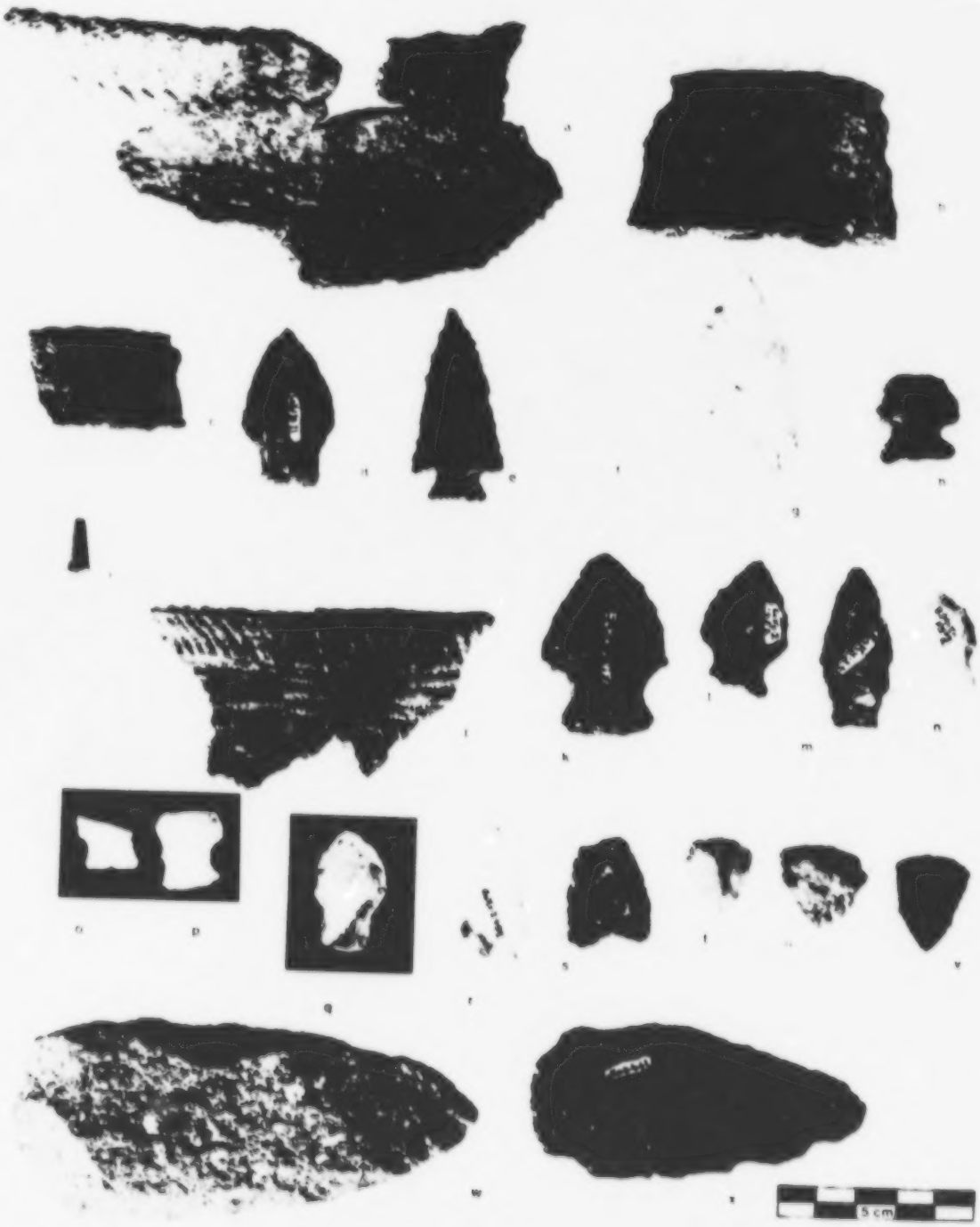

5 cm

Plate 37

EaKx-2

a projectile point base
b scraper
c,d, bifaces

EaKx-3

e ochre-stained sherds
f-g rimsherds
r-z projectile points
aa-gg scrapers

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
z
aa
bb
cc
dd
ee
ff
gg
5 cm

Plate 38

EaKx-3

a,b scrapers
c,d bifaces
e kaolin pipe

EaKx-4

f,g projectile points

EaKx-5

h rimsherd

EaKx-8

i-q rimsherds

5 cm

Plate 39

EaKx-8

a-e projectile points
f,h scrapers
i chopper
j,k bifaces

EaKx-9 (N)

l-o projectile points

EaKx-9 (S)

p rimsherd

EaKx-9 (E)

q-u rimsherds

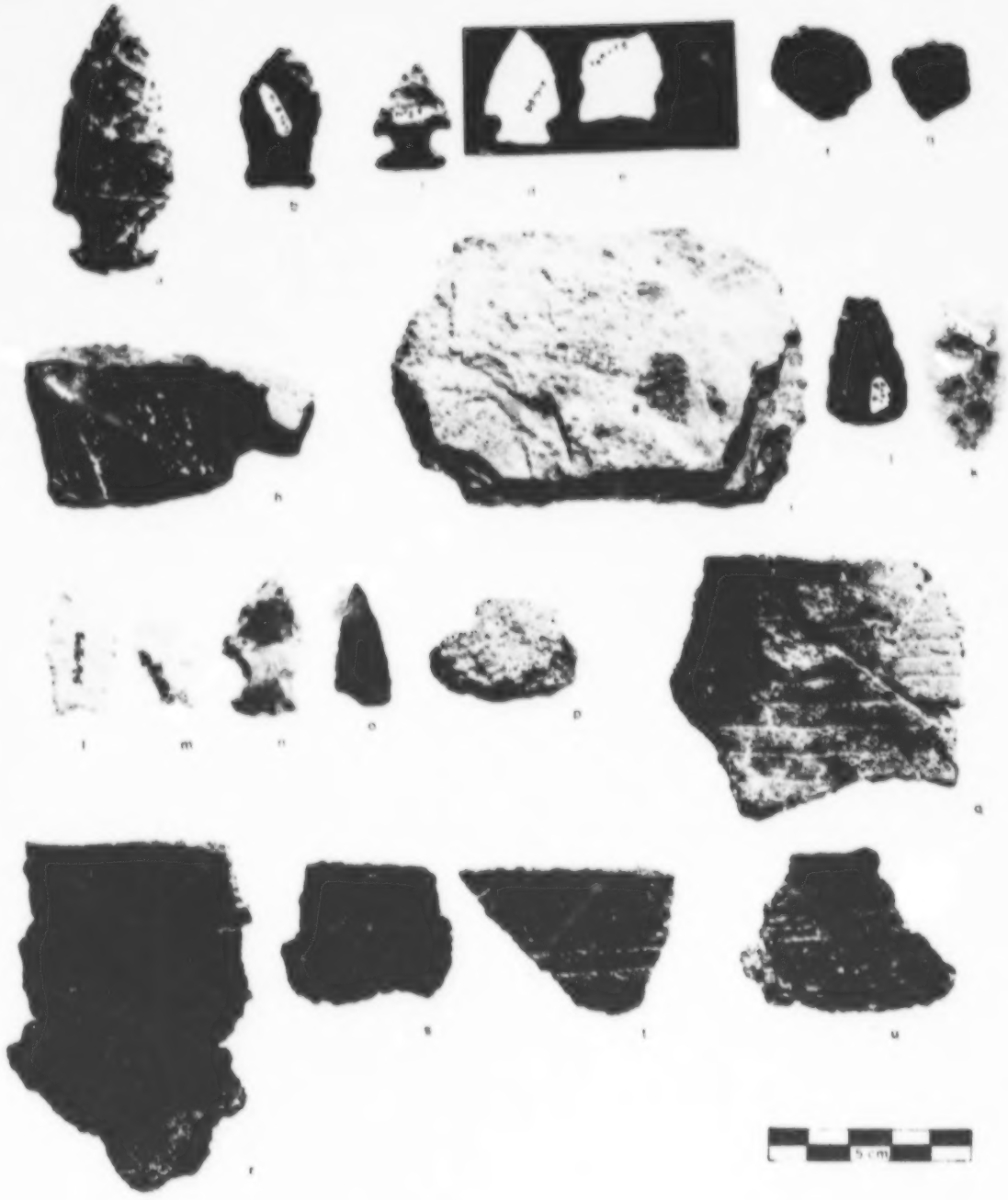

5 cm

Plate 40

EaKx-9 (E)

a-d rimsherds
e-p projectile points
q-w scrapers

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
5 cm

Plate 41

EaKx-9 (E)

a,b scrapers
c-f bifaces
g incised steatite pipe
h celt
i bone defleshing tool

a
b
c
d
e
f
g
h
5 cm

Plate 42

EaKx-9 (W)

a,b rimsherds
c-e projectile points
f,g scrapers
h biface

EaKx-12

i oolitic jasper biface

EaKx-14

j-l rimsherds
m,n projectile points
o scraper

EaKx-16

p-w rimsherds

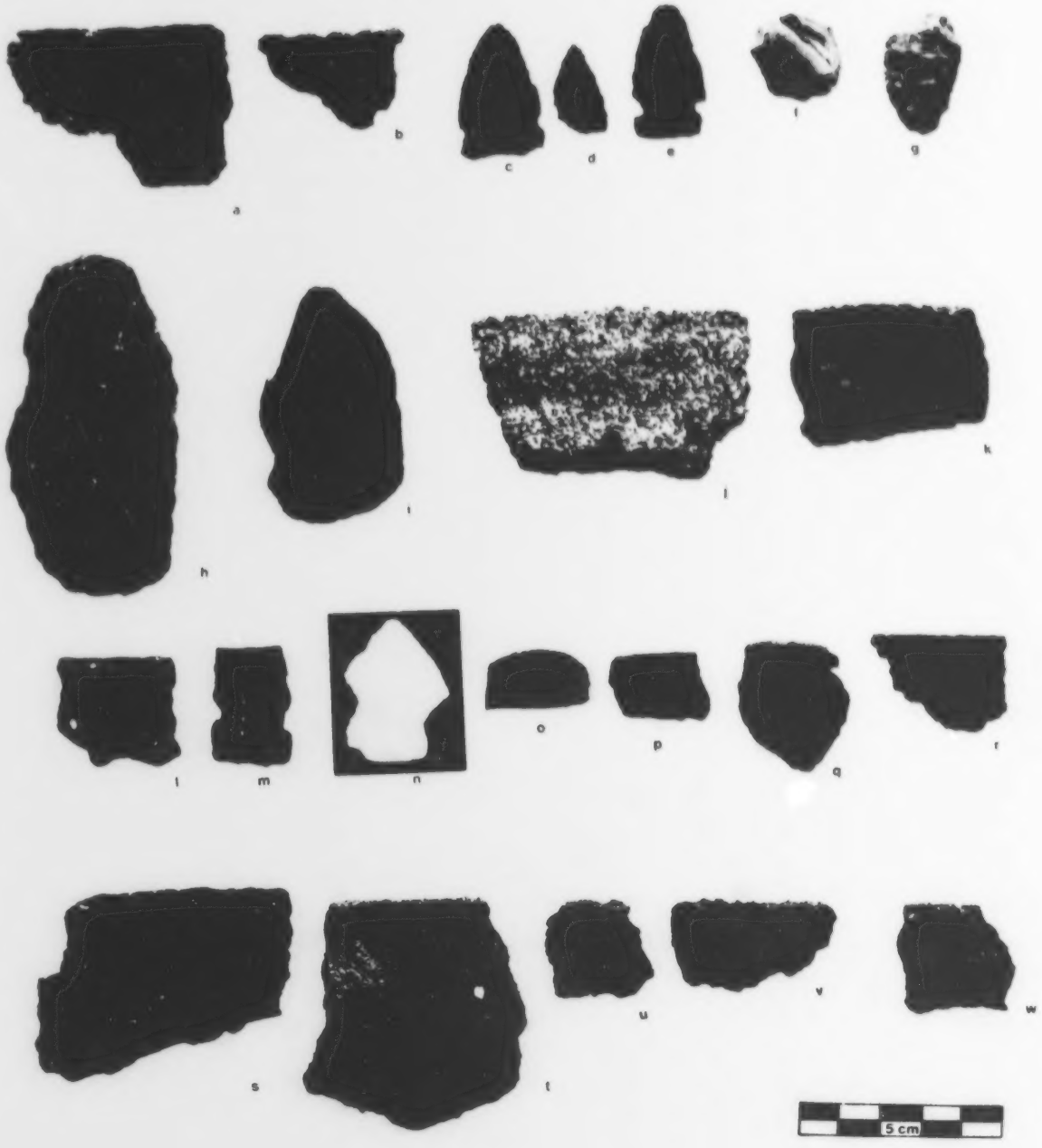

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
5 cm

Plate 43

EaKx-16

Pottery vessel reconstruction.

External diameter at mouth is
24.6 cm

Plate 44

EaKx-16

a projectile point
b-i scrapers

EaKx-17 (S)

j-v rimsherds

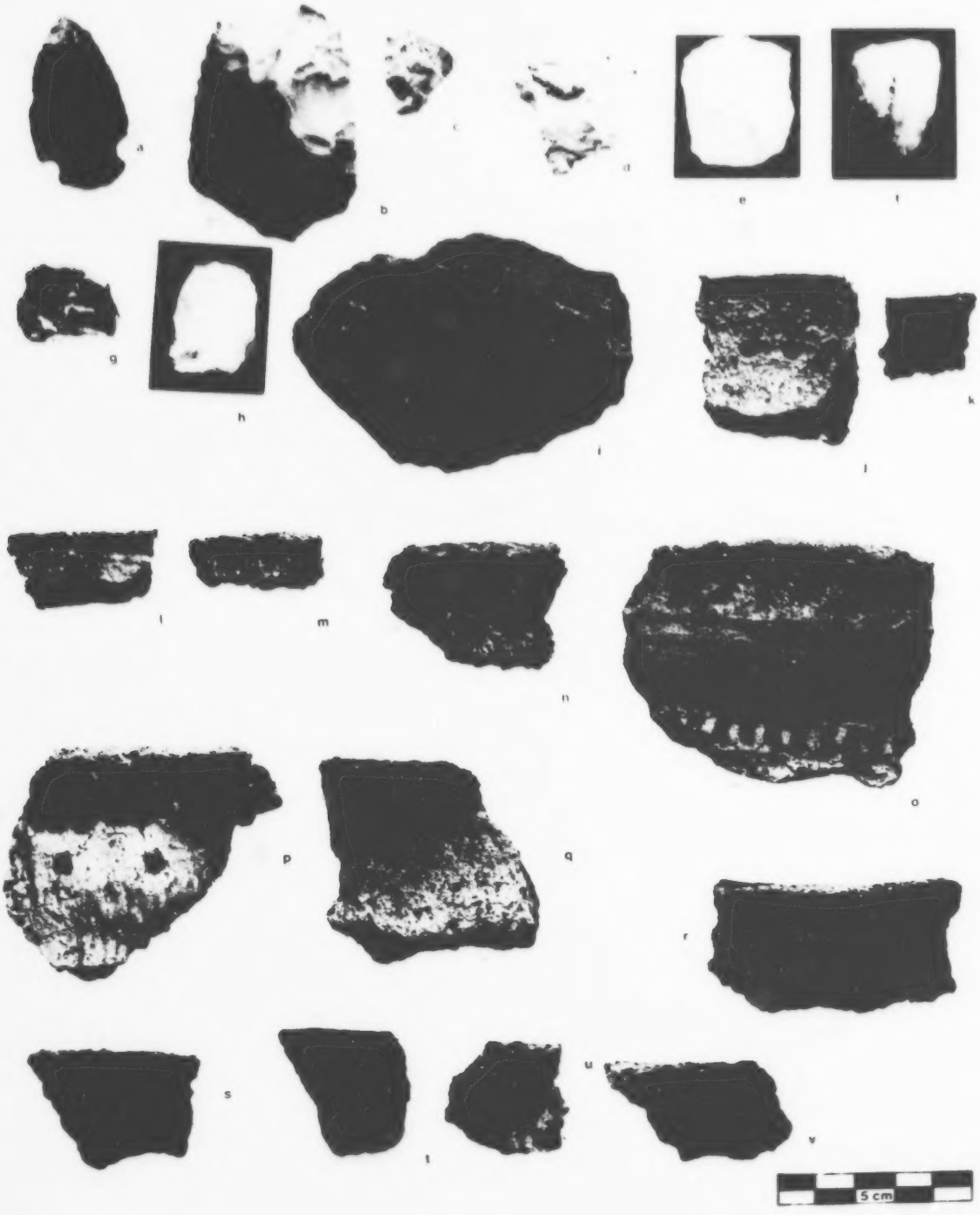

a
b
c
d
e
f
g
h
i
j
k
l
l
m
n
o
p
q
r
s
t
u
v
5 cm

Plate 45

EaKx-17 (S)

a-i projectile points
j copper projectile point
k projectile point
l-r scrapers
s biface

EaKx-17 (N)

t knife

EaKx-19

u,v rimsherds
w,x projectile points
y-bb scrapers
cc knife

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
z
aa
bb
cc
5 cm

Plate 46

EaKx-20

a,b projectile points
c scraper

EaKx-21

d projectile point

EaKx-22

e projectile point
f scraper
g biface
h scraper
i ground stone

EaKx-23 (N)

j rimsherd
k projectile point

EaKx-23 (S)

l projectile point
m,n scrapers
o,p bifaces

EaKx-24

q rimsherd

EaKx-25

r projectile point
s rimsherd

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
5 cm

Plate 47

EaKx-27

a-g rimsherds
h-m projectile points
n-q scrapers
r knife
s biface
t flake knife
u polished stone

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
u
t
5 cm

Plate 48

EaKx-27

a polished adze
b polyhedral core
c knife

EaKx-28

d projectile point
e-g scrapers
i-j bifaces
k uniface
l ground stone
m polished stone

a
b
c
d
e
f
g
h
i
j
k
l
m
5 cm

Plate 49

EaKx-29

Vessel reconstruction.

Plate 50

EaKx-30

a projectile point

EaKx-31

b projectile point
c scrapers
d,e bifaces

EaKx-32

f-k rimsherds
l scraper
m biface
n knife
o polished stone
p knife

EaKx-33

q,r projectile points

5 cm

Plate 51

EaKx-35

a,b projectile points
c biface
d scraper

EaKx-36

e-l projectile points
m-o scrapers
p-s bifaces
t utilized blade
u,v polished stones

EaKx-37

w scraper

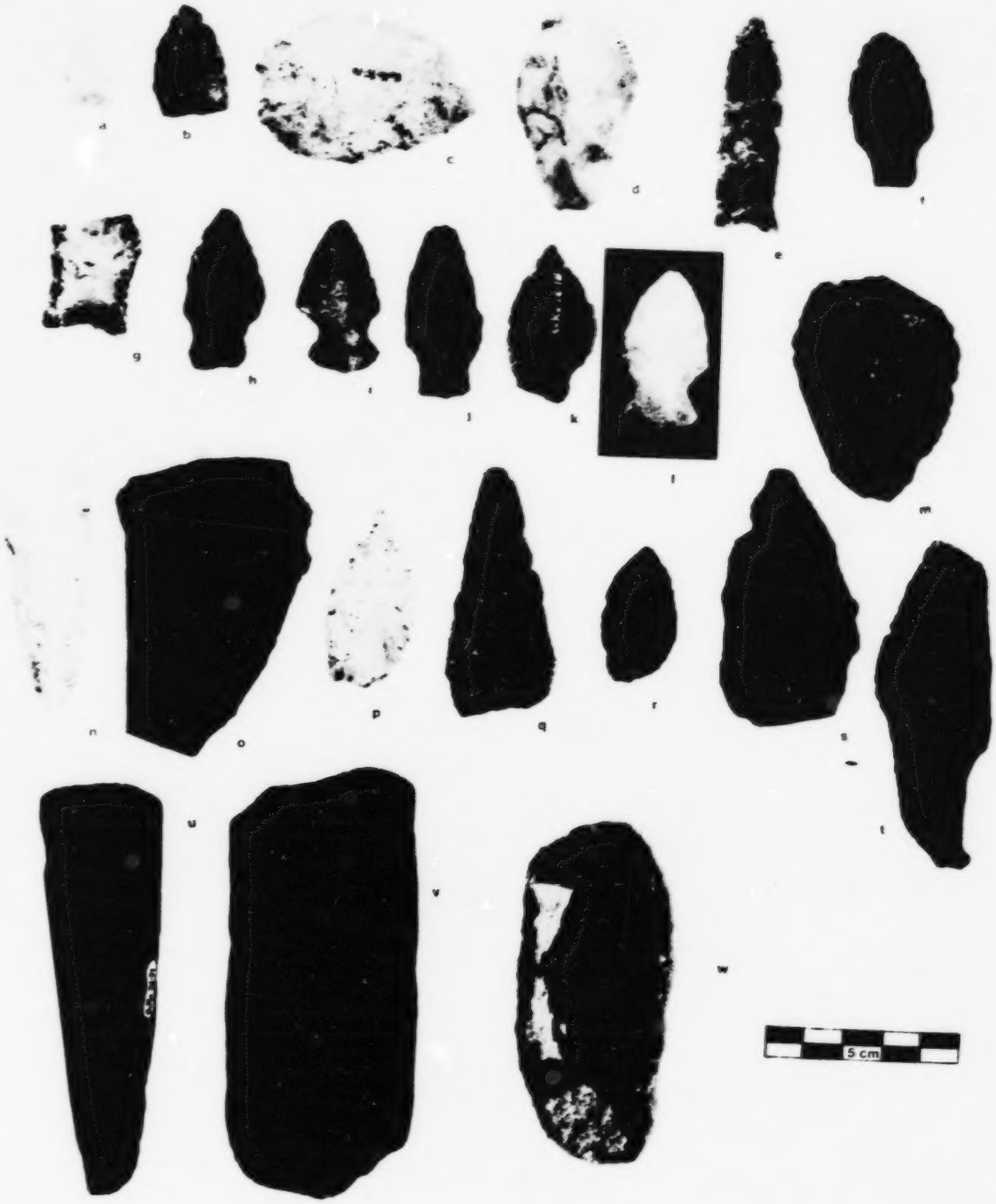

5 cm

Plate 52

EaKx-38

a,b rimsherds
c,d projectile points
e,f scrapers
g gunflint

EaKx-40

h projectile point

EaKx-41

i biface

EaKx-42

j-l projectile points
m,n bifaces

EaKx-58

o adze bit

EaKx-59

p,q rimsherds
r-x projectile points
y-aa scrapers
bb biface (perforator?)
cc, dd bifaces

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
z
aa
bb
cc
dd
5 cm

Plate 53

EaKx-60

a-c rimsherds
d,e projectile points
f scraper
g bifacial knife
h,i scrapers
j polyhedral core

EaKx-61

k,l projectile points

EaKx-62

m projectile point
n,o scrapers
p biface
q knife
r gunflint

EaKx-65

s,t bifaces

EaKx-66

u projectile point fragment
v biface

EaKx-69

w projectile point

EaKx-70

x,y projectile points

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u
v
w
x
y
5 cm

Plate 54

EcLa-5

a full-grooved maul (Ht.= 15.7 cm)

EcLa-8

b grinding stone

EcKx-22

c grinding stone

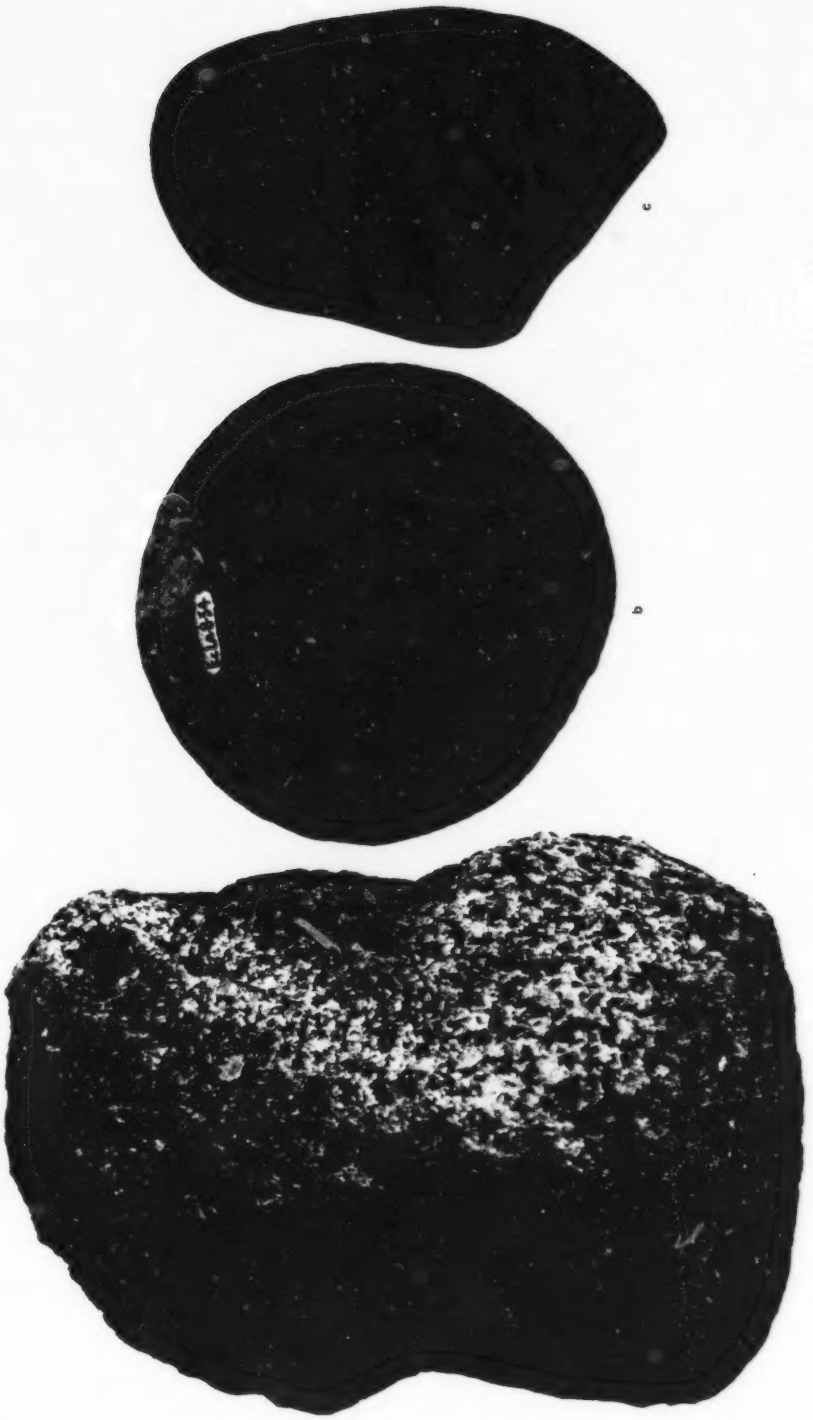


Plate 55

EaKw-9 (d)

Full-grooved maul
(Ht.= 23.3 cm)

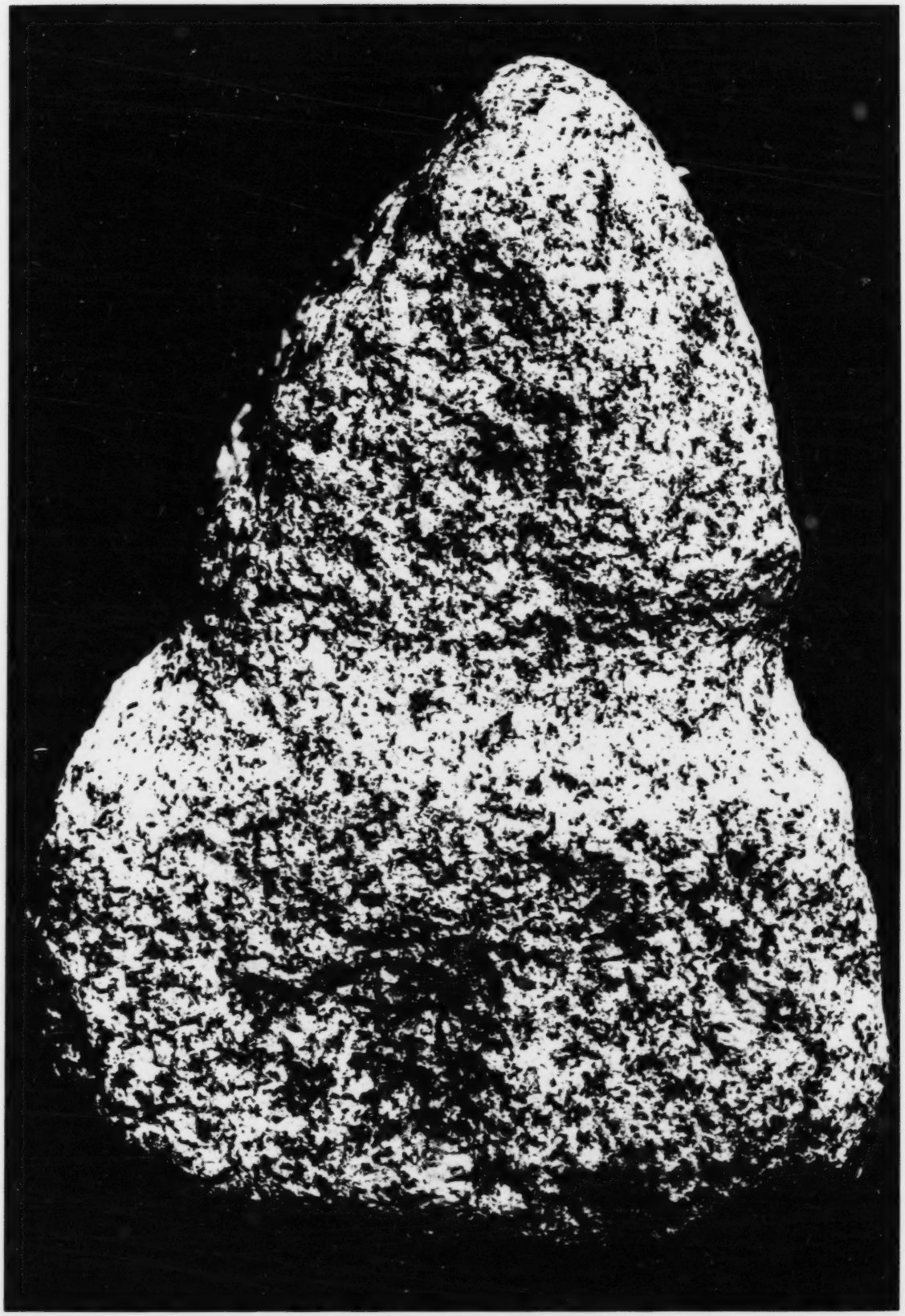


Plate 56

EaKw-22 (a)

a half-grooved hammerstone (Ht.= 14.3 cm)

EaKw-25 (a)

b ungrooved hammerstone

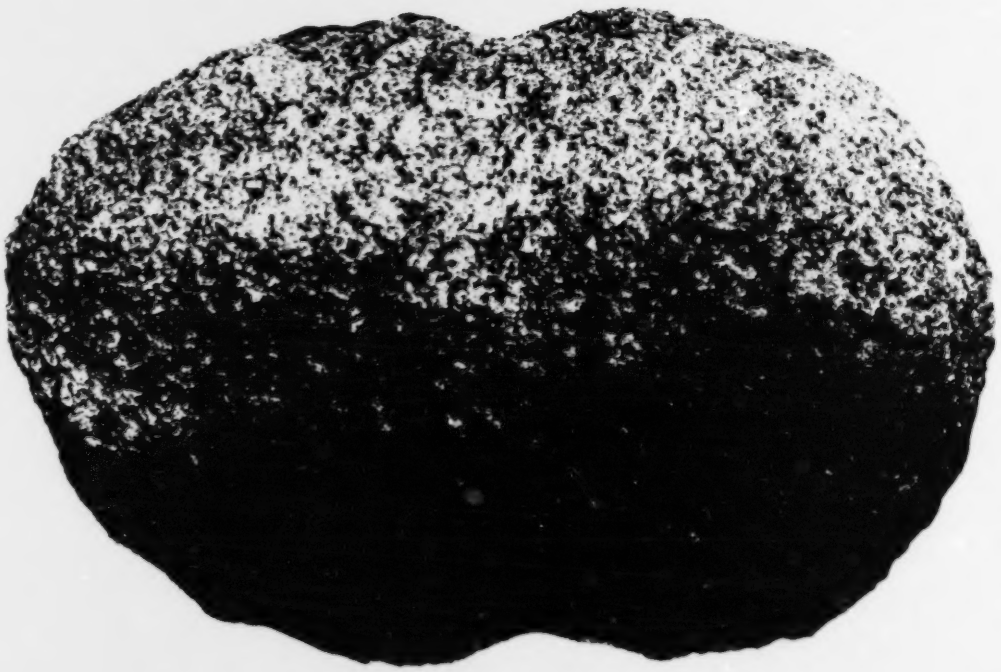
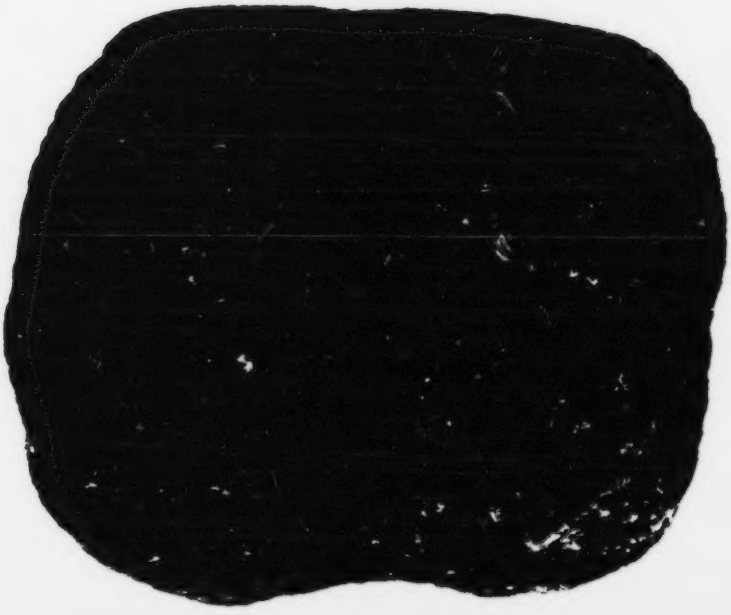


Plate 57

EaKw-28

a full-grooved maul (Ht.= 10.3 cm)
b full-grooved hammerstone



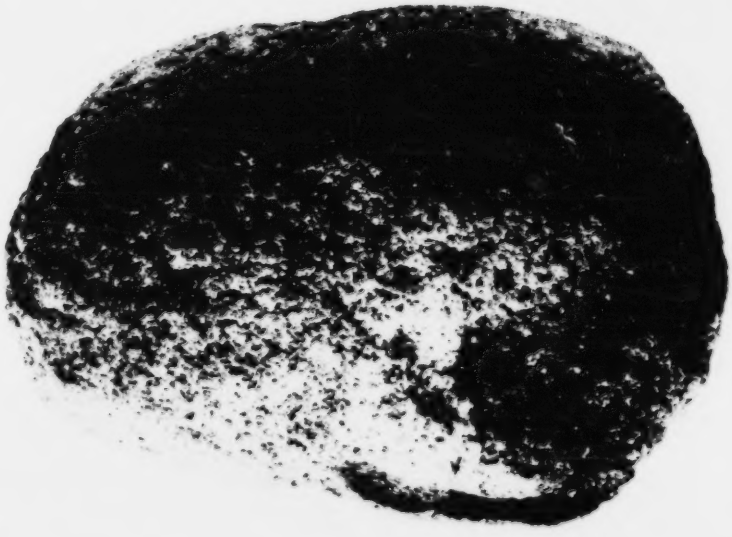


Plate 58

EaKw-29

a three-quarter-grooved maul (Ht.= 10.2 cm)
b hammerstone
c grinding stone

a

b

c

Plate 59

EaKx-3

a three-quarter-grooved maul (Ht.= 13.5 cm)

EaKx-5

b full-grooved maul

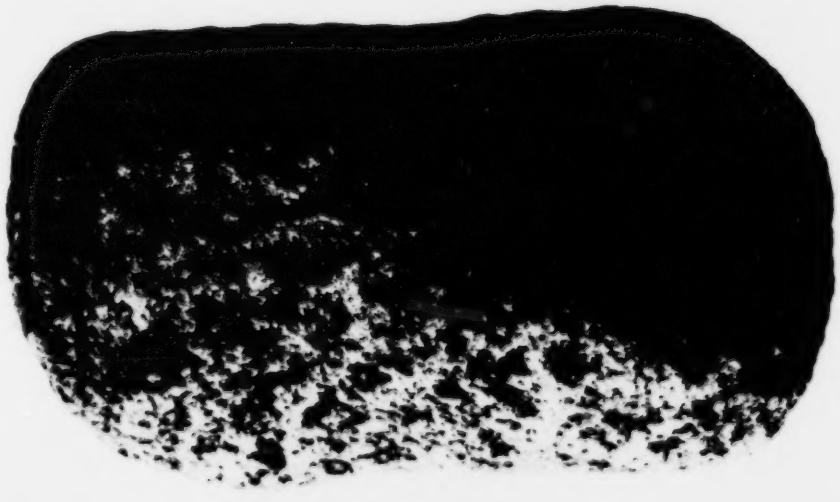


Plate 60

EaKx-8

a three-quarter-grooved hammerstone
(Ht.= 16.2 cm)

EaKx-16

b ungrooved maul

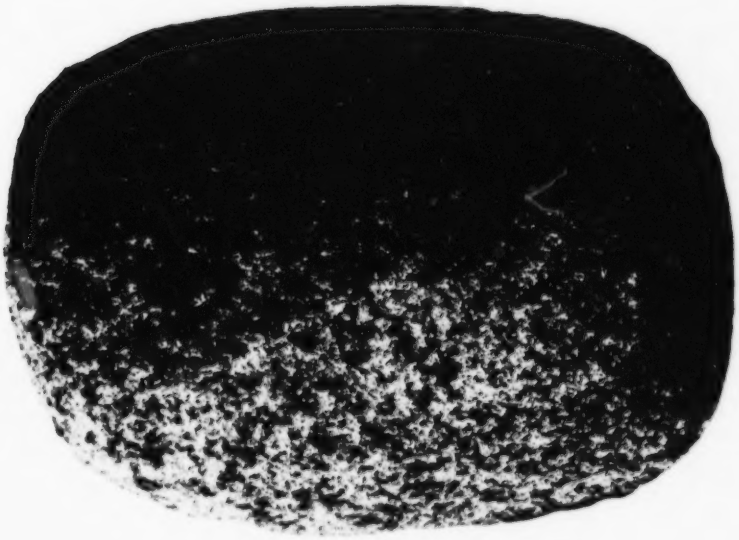


Plate 61

EaKx-27

a half-grooved hammerstone (Ht.= 14.2 cm)

EaKx-28

b full-grooved hammerstone

Plate 62

EaKx-29

Full-grooved hammerstone
(Ht.= 12.5 cm)

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